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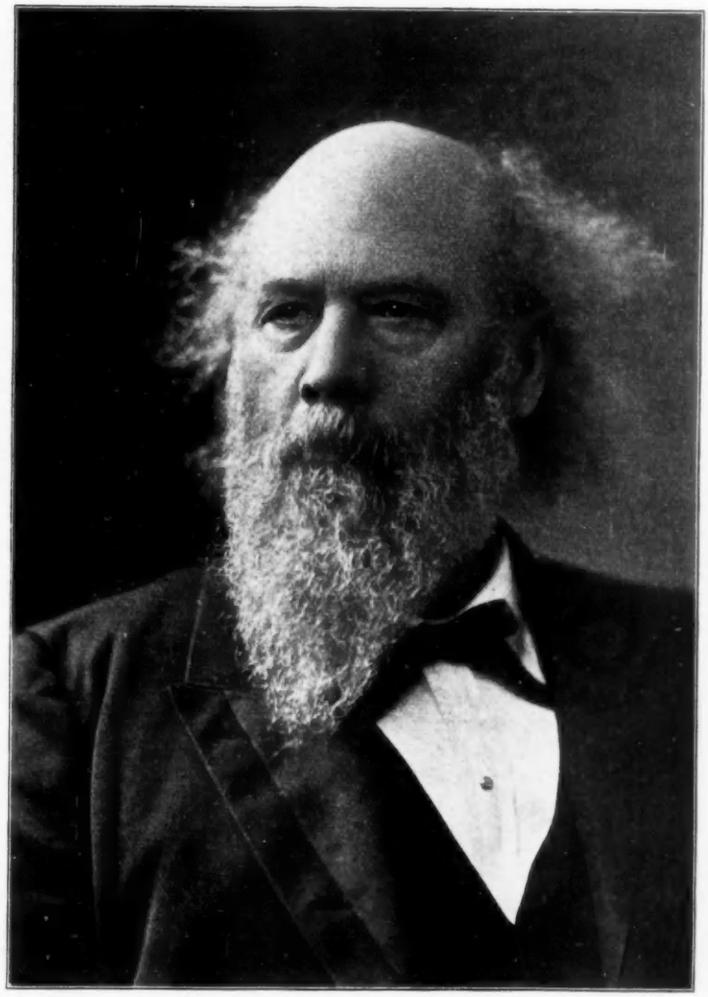
Commodore George W. Melville, U. S. Navy, the New President of the Am. Society of Mechanical Engineers.

Commodore Melville, Engineer in Chief of the Navy, who has just been elected president of the American Society of Mechanical Engineers, brings to that office a personality and a career probably the most remarkable in the history of the society, for he is not only, like his predecessors, a distinguished engineer, famous for his professional skill, but a gallant naval officer, who served with distinction through one war, and who was one of the most important of the "organizers of victory" in the war which has just closed; and above all, he is a hero, known to all the world for his magnificent courage in facing alone the terrors of the frozen North in the effort to rescue his companions of the Jeanette Arctic Expedition. Although most of our readers know parts of Commodore Melville's career, we believe all will be glad to read this brief sketch of his history, which is specially appropriate just now, when this new honor has been conferred upon him.



COMMODORE GEORGE W. MELVILLE, CHIEF ENGINEER U. S. NAVY, NEWLY ELECTED PRESIDENT AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

George Wallace Melville was born in New York city, January 10, 1841, the descendant of a line of stalwart Scottish ancestors, from whom came doubtless his remarkable mechanical genius. He was educated in the public schools of New York and the Brooklyn Polytechnic. At the close of his school days he entered the works of James Binns (Boss Binns, as Melville still affectionately calls him) as an apprentice, and laid the foundation for his intimate and extensive knowledge of practical mechanics. His memory of his apprentice days is very keen, and many an engineering opinion of to-day is accompanied by a pleasant anecdote of his experiences with "Boss Binns."

Just at the close of his apprenticeship, and before attaining his majority, the Civil War came, and Melville wanted to serve his country. His training had fitted him for naval engineering, and on July 29, 1861, he entered the Engineer Corps of the navy, and began a career which has been one of the most useful as well as most brilliant which the annals of the navy disclose. From the very beginning he displayed those traits of character which have made him famous—single-hearted devotion to duty, untiring zeal, fortitude under the most trying circumstances, absolute fearlessness and the determination never to be beaten by anything which human power can surmount.

The limits of our space forbid a detailed account of his work during the Civil War, but it may be mentioned that he was constantly on active duty, and was one of the first torpedo officers in our navy, having command of one of the torpedo launches in Admiral Porter's flotilla, where his mechanical talent was of great service. His chief exploit was in connection with the capture of the Florida by the Wachusett, of which he was one of the engineers. To get information about the enemy he went on board in plain clothes, but was driven off with a threat to sink his boat. It having been decided to capture the Florida, a council of war was held in the cabin, at which Melville proposed to sink her by ramming. To this the objection was made that the shock would start the boilers from their fastenings, break the steam-pipe joints and scald everybody below. Melville met this by the quiet proposition to stay below alone and take his chances, and the scheme was adopted. It was the intention to slip the cable and go at full speed for the Florida, but

unfortunately, after all the arrangements were made, and the engines started, the cable jammed in the compressor. It was impossible to stop, so the anchor was dragged across the bay until it caught on the bottom and broke the cable. There was not enough distance remaining for the Wachusett to get up to full speed, so that she struck at about 3 knots per hour instead of 12, which was her full speed, thus preventing any serious damage to the Florida. She was captured, however, and Melville became her chief engineer, with orders to disable and sink her if there was any danger of recapture.

His record during the war had made him known throughout the service as one of the ablest and most zealous of the younger men, and older engineers were eager to have him detailed as one of their assistants. As a consequence he was almost always at sea, and served in every part of the world. He was full of resource, and with means that would now be considered ridiculously inadequate made repairs that would even now be counted remarkable. His last cruise as a junior engineer was on the old Tennessee, when she had just been fitted with compound engines, at a time when they were not well understood, and he made so many changes and improvements as to amount almost to rebuilding her engines.

Prior to this cruise he had made his first excursion to the Arctic as chief engineer of the Tigress in the Polaris Relief Expedition. In spite of the defective condition of the machinery, Melville managed to drive this little yacht in thirty days farther north than Dr. Kane's expedition got in three years. Commander (now Admiral) Greer, the commanding officer, frankly stated in his official report that the sucess of the expedition was due to Melville's ability and fertility of resource under very discouraging circumstances.

When the ill-fated Jeanette expedition was planned Melville volunteered as her chief engineer. Before this time his reputation was confined to the navy; at the close of the expedition the whole world knew him as one of those heroes of whom the whole race is proud for a record of sublime courage and absolute forgetfulness of self in the cause of humanity. From the very first Melville seems to have been the main reliance of De Long, whose journals of the expedition sound his praises again and again. In speaking of the landing on Henrietta Island, their first discovery, De Long says:

"Near the island the ice was all alive, and Melville left his boat and supplies and carrying only a day's provisions and his instruments at the risk of his life went through the terrible mass, actually dragging the dogs, which from fear refused to follow their human leaders. If this persistence in landing upon this island, in spite of the superhuman difficulties he encountered, is not reckoned a brave and meritorious action it will not be from any failure on my part to make it known."

During the long siege in the ice, after the ship was frozen in, Melville was continually rendering valuable service and eliciting the warmest commendation in De Long's journal, who repeatedly refers to him as invaluable and capable of building an entire engine from raw material. The necessity for constant pumping to keep down a bad leak led him to contrive all sorts of devices for saving coal, culminating in a pump and windmill of his own manufacture. In other ways, too, he was of the greatest value. His courage and cheerfulness never faltered, and he kept up the spirits of the others by his songs and good-natured jokes.

The fearful retreat over the ice pack after the Jeanette was crushed gave an opportunity for the exhibition of his qualities as a leader of men. His machinery and tools were gone with the ship, and with them the exercise of his talents as an engineer, but the almost insurmountable task before them gave Melville, the man, the chance to show the stuff that was in him, and his indomitable will knew not failure. Many people have the mistaken idea that sledging over the Arctic pack is like sleighing on a pond, but instead of this the ice peaks present a surface only comparable to that which would be presented by a journey over the house tops of a big city. Roads have to be cut, ice bridges made over water leads and the three heavy boats, on sledges, hauled by hand. There were in all seven loads, and it required thirteen miles of travel for the party for each mile of progress.

After frightful hardships open water was reached, and the rest of the journey was in the boats. A gale separated them, but the boat under Melville's command finally reached a fishing village on one of the mouths of the Lena, and his party was safe, although nearly everyone was almost helpless from frozen hands and feet, Melville himself being in especially bad shape on account of his exposure during the gale, when he personally "tended the sheet" to make sure that the boat should not capsize through any oversight. His first thought, however, was for his companions in the other two boats, and he used every effort to start a relief party to them. It was not, however, until word reached him of the presence of two *Americanskis* in another village that he could induce the natives to move. His hands and feet were still almost useless, but he went at once to see Noros and Nindemann, learned from them where they had left De Long and the route they had come, and at once started to their succor.

Then followed a battle with the elements, with hunger, with disease and native ignorance such as the world has rarely seen, and in which only his powerful will and iron constitution enabled him to come through alive. His only companions were two Yakuts, with whom he had but a few words in common, and he was really at their mercy, for he was still almost helpless; yet when they were discouraged and wanted to turn back he threatened to shoot them and prevented their desertion. Senator Chandler, in a report recommending Melville's promotion for heroism, says:

"The story of this terrible journey, told in simple and modest language in his book, 'In the Lena Delta,' has given the world a record of constancy and courage which has never been surpassed. With hands and feet frozen as to be almost helpless, alone with the Yakuts on the shores of the Arctic Sea, his supreme courage and endurance compelled the prosecution of the search when even those hardy natives were cowed by the elements and unwilling to go on."

Notwithstanding this heroism and self-sacrifice, the seach was unsuccessful, and it was not until the next spring that Melville found the bodies of De Long and his brave companions, who, as the journal showed, were dead before he started to their succor the first time. Having given his dead comrades burial in the Arctic highlands, he returned to the United States, receiving all along the journey the reception which his heroic deeds had merited, including a special audience with the Czar and Czarina of Russia, and terminating with a public reception at the City Hall in New York.

It was at once proposed to reward him by advancement, but delay occurred, and it was not until 1891 that Congress advanced him a grade "as a recognition of his meritorious services in successfully directing the party under his command after the wreck of the Arctic exploring steamer Jeanette, and of his persistent efforts, through dangers and hardships, to find and assist his commanding officer and other members of the expedition before he himself was out of peril."

In spite of the fearful experiences through which he had passed, Melville was eager to continue Arctic work, and proposed a plan for reaching the pole which has, in part, been followed by Nansen and Peary. When the Greely Relief Expedition was organized Melville volunteered, and became chief engineer of the Thetis. His advice as to the fitting out of the expedition was of the greatest assistance, as was his work during the voyage. This ended his active connection with Arctic exploration, but not his interest, and his advice has always been asked in such matters, he being the authority for the press representatives whenever Arctic subjects are under discussion.

Soon after his return from the Greely Relief Expedition Melville was appointed inspector of machinery of the ships building at Cramps, and thus began his active connection with our "new navy," nearly all of whose machinery has been designed by him or under his direction.

In 1887 Secretary Whitney met Melville and, like all others, was greatly impressed with his strong personality. He asked Melville if he could design machinery to equal what was being built abroad, and on being assured of that fact, gave authority to design the machinery for a 4,100-ton cruiser. This was placed in the San Francisco, and has proved a great success.

When Commodore Loring resigned as engineer-in-chief, in 1887, Melville was appointed his successor, was confirmed when Congress met, in January, 1888, and has twice been reappointed, so that he is now serving his third term, an unprecedented record. When he took office the only modern vessels in commission were the Atlanta, Boston and Dolphin, so that practically the entire upbuilding of the modern fleet, as far as machinery is concerned, has been done under his superivsion.

The work which he has accomplished during his term has been immense, and some idea of this is obtained when it is stated that he has been responsible for the design of machinery for 120 ships and 700,000 horse-power. This alone, however, merely gives the magnitude of the work. Its quality is even more important. Here the items that count are boldness and progressiveness, tempered by sound mechanical judgment, and these qualities Melville has displayed in a remarkable degree. It is very easy to gain for a day a reputation for progress, but in machinery time settles the wisdom of the course pursued.

About the beginning of Melville's term there was a craze all over the world for reducing boiler weights to the last degree, and the talented Sennett, the English engineer-in-chief, ruined his reputation by the effort to get a horse-power on less than 1.5 square feet of heating surface. At first there was nothing but praise for him, but when one ship after another proved a failure, it was found that he had been reckless. Melville refused absolutely to go to such lengths, his favorite expression being, "I never send a boy to do a man's work." While the English ships were being pulled through at reduced powers by the Admirality ferrule, ours went along without a single failure or mishap, and the rest of the world found that Melville, while as bold as the boldest would not sacrifice sound engineering to popular clamor.

One of his first acts was to get out designs for very light machinery for launches with water tube boilers, and, while this practice has since prevailed in our navy for years, it is still the only one which uses these boilers to any great extent. Finding that the use of blowers for stimulating the draft proved objectionable on account of noise, he instituted a series of experiments on steam jets to determine the most economical, and these experiments furnish the only data on the subject.

The next important step was the introduction of the water tube boiler. As far back as 1888, when the largest installation on shipboard of such boilers did not exceed 2,500 I. H. P., he arranged to place 4,800 I. H. P. in the Monterey, and instituted competitive tests, to which all the boiler makers in the country were invited to contribute, as a result of which Ward boilers were installed.

He was the first to secure accurate data of the coal consumption on forced draft trials, although it is now an everyday practice, and the results were startling. Estimates had been made by many writers much below what was shown to be the fact, and ships were credited with radii of action about double what they could really do.

He was also the first to insist on the standardization of indicators, with results that were at first discouraging, but they led to much greater care in the manufacture of indicator springs and have proved of great benefit to all the engineering profession.

Probably his greatest professional success has been the triple-screw flyers Columbia and Minneapolis, each of which for a time held the record as the fastest ship in the world. While not the originator of multiple screws, he deserves every particle of the credit for the great success of this machinery, because he stuck to his design in spite of the advice of his best friends in the profession, who endeavored to dissuade him, and predicted anything but success. When designed, these ships had the largest machinery afloat, and it was here that the boldness of their designer appeared. The friendly critics were willing for a trial on a small scale, but utterly opposed to what they considered such a big and risky experiment. Now all the large ships of the French and German navies and many of those of Russia are fitted with triple screws.

Everything looking toward improvement has found a willing friend in Melville. He wants only a reasonable assurance from actual tests on a working scale to be ready to adopt anything that promises an increase of efficiency.

Space forbids further detailed notice of his engineering work, and it is unnecessary because we have brought our sketch down to the last few years when everybody knows just what he has done. We may remark, however, on the great service he has so recently rendered the country in his earnest efforts to make our new battleships worthy of the nation. In spite of his objections, it had been decided to give them a speed of only 16 knots, but when it became known that he was ready to guarantee 18 knots, which all the rest of the world had adopted as a standard, the press of the country backed his position so strongly that the 18-knot vessels were secured.

The splendid work done by Commodore Melville in preparing and repairing the machinery of our ships for the Spanish war, the fitting out of the repair ship Vulcan, the establishment of economical distilling ships, the reboilering of the old monitors in thirty days, have all been noticed in our columns and are familiar to our readers.

Such is the professional and official record of the new president of the A. S. M. E., and the society may well delight to honor a member of the profession who has shed such luster on the name of engineer. Personally he is one of the most attractive of men. A handsome face and commanding presence point him out as a remarkable man in any assemblage; yet he is one of the most modest of men, and is hard to lionize. While a man of deeds rather than words, he is a most entertaining talker and writer, and is a frequent contributor to professional and general literature. His book, "In the Lena Delta," is one of the most fascinating accounts of travel and adventure ever written, and has been translated into several languages. He is frank and outspoken, and, as might be imagined from his record, absolutely fearless. Always direct himself, he likes it in others, and is very impatient of anything that savors of flattery. He is a friend who never fails, and as a superior officer commands the affection and loyalty of his subordinates in a degree rarely equaled. He is never happier than when telling of the capability and good work of his assistants, to whom he always gives the credit for whatever suggestions they make. His kindness in bringing his assistants forward works to his own disadvantage, as it has led to the loss of some of the men, who were his active helpers, but he turns to the other brainy men of his corps and develops them. Work under such a chief is an inspiration, and there is not one of his assistants who would not count it a favor to be allowed to work double time if it would "help the chief."

The commodore is an officer of the Commandery in Chief of the Loyal Legion, a member of the Grand Army of the Republic, and an active or honorary member of so many scientific societies that the list would require too much space to print.

We congratulate him on this additional honor, and we also congratulate the society upon its selection of so eminent and honorable a president.

A Chart of Bolt Strengths.

BY LAWFORD H. FRY.

Many classes of engineering information can be more compendiously given by the use of charts than by the drawing up of tables, and the subject of this article is, it is thought, a case in point.

The accompanying diagram will give an amount of information concerning the strength of bolts, which, if set forth in tabular form, would be burdensome both to compiler and user of the tables. The chart is easily constructed, and the manner of using it is simple, while its utility the reader is left to recognize. Having given any three out of the four factors determining the carrying power of a bolt, to wit—diameter of bolt, load, ultimate strength of material and factor of safety allowed—the diagram will, by inspection alone, give the unknown quantity.

Each of the four sides of the rectangle inclosing the chart is marked with a scale, one for each of the above named factors. At the left end are two columns for the diameter of the bolt; the one referring to bolts in shear, the other to bolts in tension, as set forth at the heads of the respective columns. This duplication is rendered necessary by the fact that with a bolt in shear, the whole section is effective in resisting rupture, while when resisting tension the area of the section at the root of the thread, being the least section, is that which determines the strength of the bolt.

In the present case the bolts are taken as having Sellers standard threads. The diameters in the shear column may also be used for rivets or to determine the strength of unthreaded rods in tension.

Along the top of the rectangle the scale gives the load the bolt is to carry. The divisions here are not all of equal value, the scale changing at 20,000 pounds. Up to this point the heavy lines are drawn at distances representing 1,000 pounds; beyond 20,000 pounds the spaces between the heavy lines represent 10,000 pounds. Terminating at the right-hand end will be found five horizontal dot and dash lines marked with factors of safety from 1 to 5. Finally along the bottom is a scale for the breaking or ultimate strengths of the material.

To see the method of using the chart let us take the following example:

What diameter of bolt is required to carry a load of 3,500 pounds, with a factor of safety of 4, the bolt being in tension, and of a material having an ultimate strength of 46,000 pounds per square inch? We pick out by the bottom scale the vertical line corresponding to a breaking strain of 46,000 pounds per square inch, and follow it up until it meets the horizontal line for the factor of safety, 4. Then choosing the diagonal line, which passes nearest the point of intersection, we follow this to its point of meeting with the vertical load line for 3,500 pounds, when the nearest full horizontal line will give, in the column of diameters, the size of the bolt we want. In the case we are considering the intersection of the ultimate strength and factor of safety lines occurs just about midway between the diagonal lines marked 10,000 and 12,500; which shows that the allowable fiber strain in pounds per square inch is between these values. Since bolts are only made in standard sizes, advancing in diameter by ⅛ inch, greater accuracy is not necessary. Following the diagonal fiber strain line, 12500, up to its point of intersection with the vertical load line for 3,500 pounds, as marked on the top scale, we find this point to lie just above the horizontal line which is marked ¾ inch in the tension bolt column. This is then the standard sized bolt which most nearly fulfills the demands of the problem. It will be noticed that the line which is marked ¾ inch in the tension column is marked ⅝ inch in the shear column. This means that in a ¾-inch bolt the diameter at the root of the thread is only ⅝ inch.

If the 3,500 pounds of the problem were to be carried by a bolt in shear or by an unthreaded rod, we should only need a diameter of ⅝ inch.

The chart would have solved the problem if given in another form, as for instance, what diameter of bolt is required to sustain a load of 5,500 pounds with a fiber strain of 10,000 pounds per square inch? To solve this we choose at once the diagonal line marked 10,000 and follow it till it meets the vertical line representing a load of 5,500 pounds. This occurs just on the horizontal line marked for tension 1 inch, and a bolt 1 inch in diameter will meet the requirements of the case.

Having a certain sized bolt given, we can ascertain the load it can carry by finding the point of intersection of the diagonal fiber stress line, with the horizontal line named for the bolt diameter. The value of the vertical line through this point as given on the top scale gives the allowable load. Thus we find that a bolt 1¼ inches in diameter will, with a fiber strain of 12,500 pounds per square inch (ultimate strength 50,000 pounds per square inch, factor of safety 4), carry a tension load of 11,000 pounds.

Again, the bolt diameter and the load being given, the approximate fiber strain can be found by noting the diagonal line which passes nearest the point of intersection of the vertical load line and the horizontal diameter line.

If desired, additional fiber strain lines can be drawn easily and without any calculations.

The rectangle of the chart is divided, as regards the diagonal lines, into six "fields" by the load line 20,000 and the factor of safety lines 1 and 4. Wherever a fiber strain line passes from one field to another it makes a bend. This is due to the fact that the scale of the chart is not uniform throughout, but changes as will be explained below. In each field, however, the diagonal lines, all run so that if produced they would meet in one point. Then to draw a fiber strain line through any desired point, we join this point to the meeting point of the fiber strain lines for that field. This point is easily found by producing any two of the lines till they meet. This gives one section of the desired line, and the point where this section leaves the field in which it was drawn gives a point on the line in the adjacent field, and we can repeat the process for this field. A continued repetition of the process will give the complete fiber strain line. To determine the value of the fiber strain corresponding to a line so drawn, we take advantage of the fact that a bolt of 1⅛ inch diameter opposes to a shearing force an area of practically 1 square inch (0.996). Consequently when this bolt is loaded the number of pounds in the load is the number of pounds per square inch fiber strain; so that at the intersection of our fiber strain line with the 1⅛-inch bolt (shear) line, the load in pounds gives the value of the fiber strain.

When once the reader has grasped the idea of the chart he will see it possesses an attractive quality which can hardly be found in a set of tables, namely its easy elasticity. Additions and interpellations can be made without the necessity for any figuring.

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Technical Publications.

MECHANICAL DRAFT FOR STEAM BOILERS. By Walter B. Snow.

This is a treatment of the above-named subject by a member of the engineering staff of the B. F. Sturtevant Company, and, while it is printed and circulated mainly of course for business reasons, it nevertheless contains information of interest to those who have to do with steam plants. We understand that copies of it may be obtained free of charge by addressing the B. F. Sturtevant Company, Boston, Mass.

THE PRACTICAL ENGINEER'S POCKET-BOOK FOR 1899. 402 3¼x5½ inch pages, with numerous illustrations. The Technical Publishing Company, of Manchester, and the D. Van Nostrand Company, of New York. Price, 1s. 6d.

We have had occasion before now to notice this book, of which a revised edition is put out each year. The present volume is in some respects an improvement on its predecessors, and deserves cordial commendation, both for the value of the contents and the surprisingly low price at which it is sold.

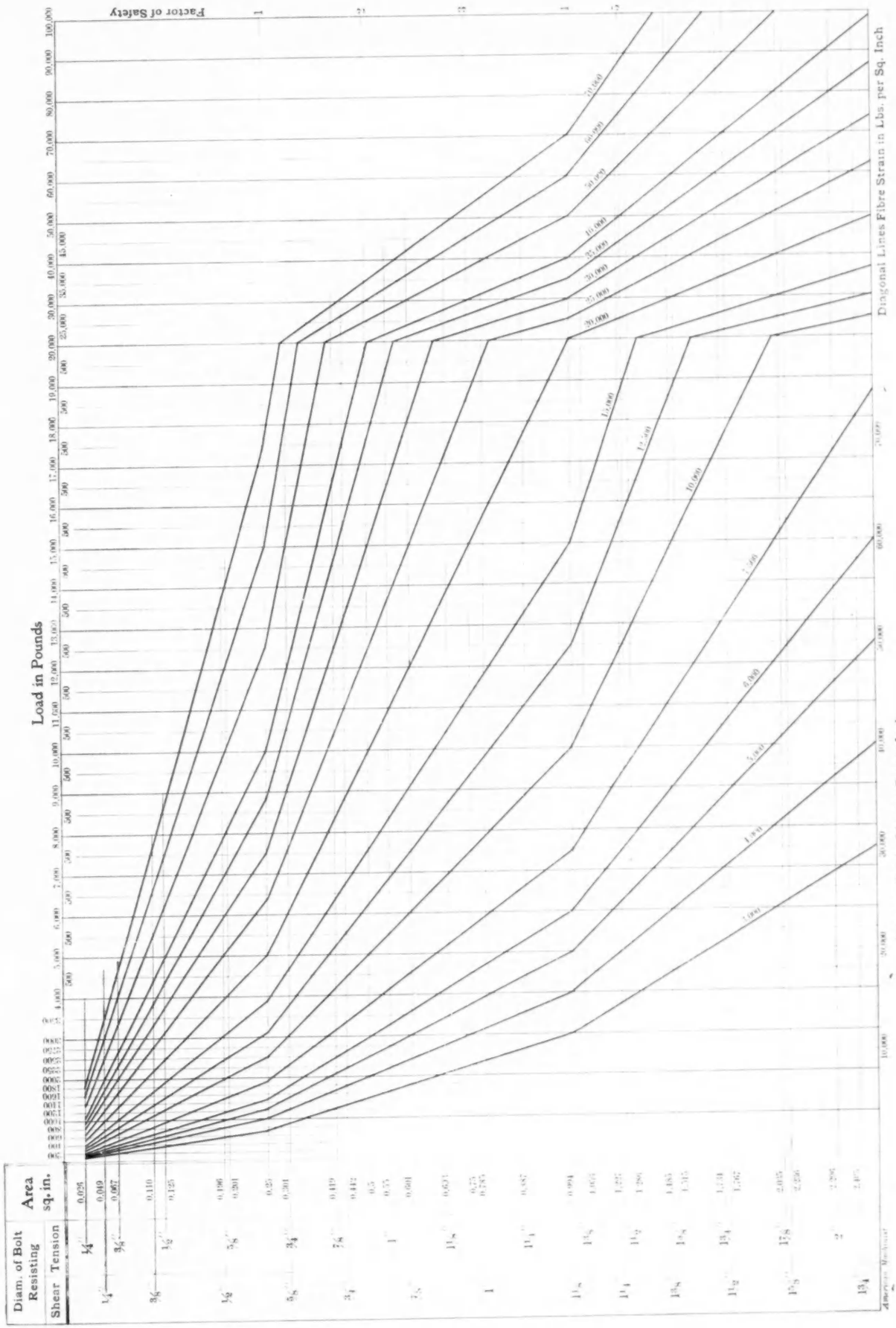
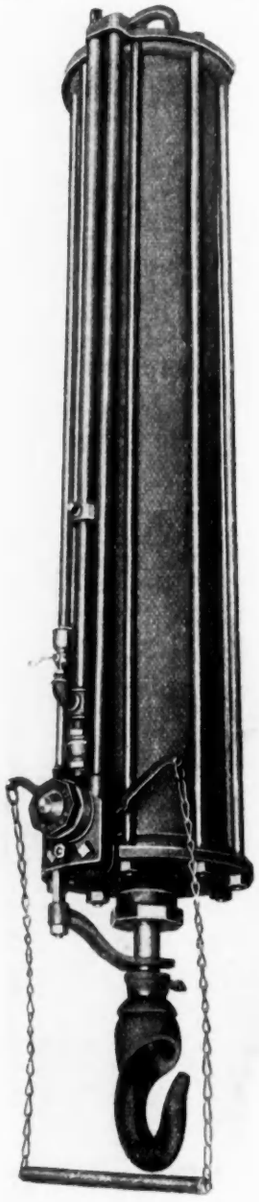

Load in Pounds
Factor of Safety
Diagonal Lines Fibre Strain in Lbs. per Sq. Inch
Breaking Strain Lbs. per Square Inch
Diam. of Bolt Resisting Shear
Area sq. in.

CHART OF BOLT STRENGTHS.

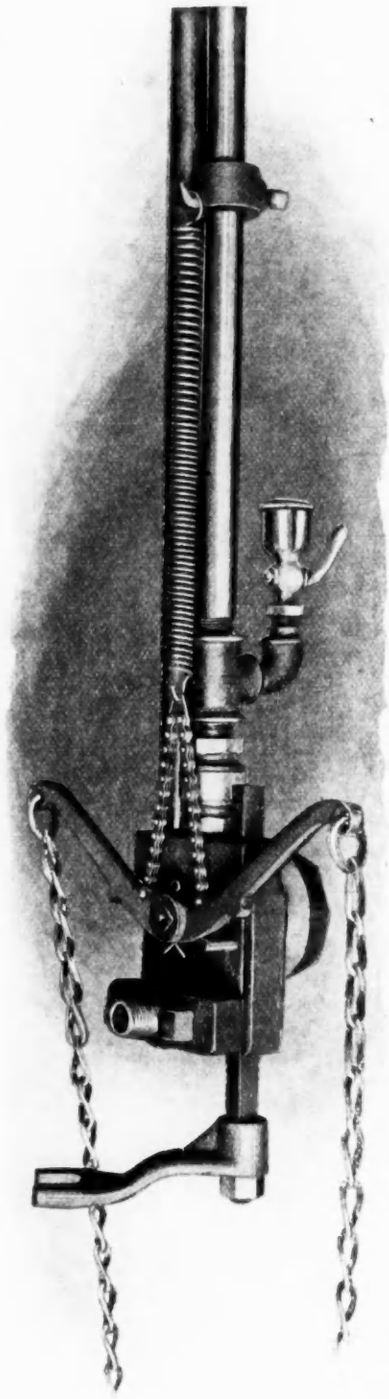
An Improved Pneumatic Hoist.

In essential principle a direct-acting air hoist is an extremely simple thing. The supply of compressed air being provided at suitable pressure, the hoist need consist of only a suitable cylinder with means of suspension, a piston with its rod and provision for attaching to the load or weight to be raised, and a valve for controlling the admission and discharge of the air. When it comes to the regular use of air hoists, however, it is found that there is a great difference in them, and



IMPROVED AIR HOIST.

that they admit of many refinements which add considerably to their convenience and operative value. One of the more recent and up-to-date air hoists we show in the accompanying half-tones, Fig. 1 being a view of the hoist complete, and Fig. 2 being an enlarged view of the valve and its appurtenances, detached from the hoisting cylinder and looked at from the side attaching to the cylinder. The air hose is attached at the upper end of



VALVE AND OPERATING DEVICES OF THE AIR HOIST.

the cylinder and goes down the small pipe to which the oil cup is attached. Although the hoist requires occasional oiling the quantity of oil required is very small. This oil cup delivers a single drop of oil for each turn of the handle, which oil distributes itself effectively over the valve surfaces and the interior of the cylinder and keeps the parts in good working condition. The valve used is a sliding valve with the pressure upon the back so that it will always wear tight and remain tight. The lever shaft also is shouldered on a ground surface by the air pressure, and there is no stuffing-box or anything requiring attention or adjustment about the valve box. The valve lever is normally and positively held in a central position by the long spring and the chains attaching to the two levers. A pull upon one lever admits compressed air below the piston and raises the load, and a pull upon the other chain allows the air to escape and the load to descend. In either case upon releasing the chain the lever and valve are automatically brought to the central and inoperative position. The arm with the forked end clasping the piston rod is for automatically stopping the lift at any point desired by adjusting the set collar on the piston rod. A safety check is provided, so that the load will not fall in case the air hose breaks while hoisting, and also a speed adjustment so that slow movement may be had irrespective of the amount of valve opening or load. The valve can be furnished for admitting and discharging air at both ends of the cylinder if ever required.

Some of our readers will perhaps notice the impossible curve in the chain. We have an impression that this hoist was photographed in a horizontal position with a string attached to the crossbar (and erased in the negative), for holding the chain in position, but not sufficient to prevent the evident catenary curve to the chain.

The hoist is made by the Curtis & Co. Manufacturing Company, St. Louis, Mo.

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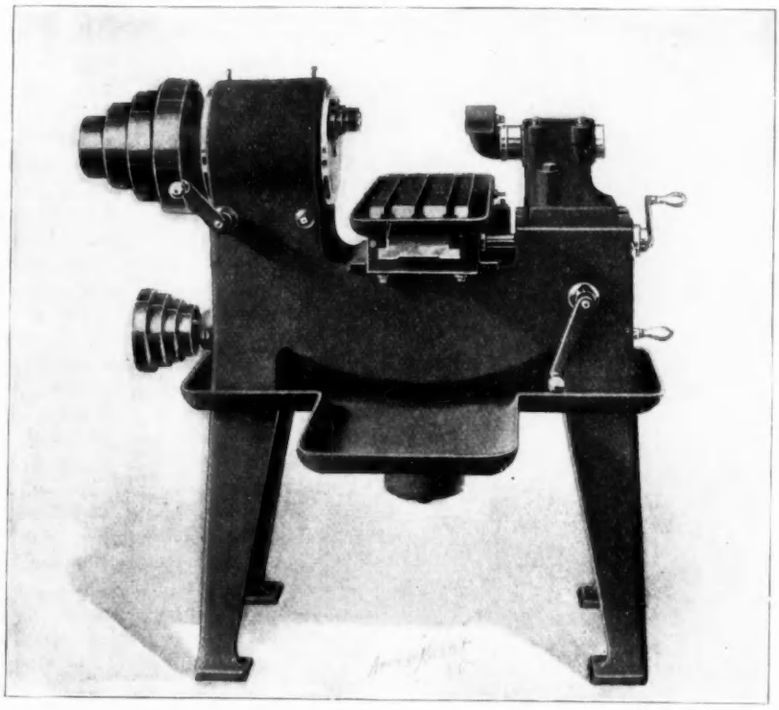
The latest issue of "The Locomotive," published by the Hartford Steam Boiler Inspection & Insurance Company, gives an interesting account of an investigation of the means maliciously employed for the destruction of a horizontal tubular boiler, the evidence being very clear and conclusive that the boiler was destroyed by the explosion of a bomb of dynamite, or other high explosive, which had been inserted in one of the tubes. We are happy to agree fully with the opinion expressed by "The Locomotive" that these cases of criminal destruction of boilers are very rare. It says: "We strongly doubt if 1 per cent. of the explosions reported to be intentional are so in reality. Most of the reports of this kind arise among persons who are not familiar with the tremendous destructive energy of exploding steam, and to such persons a resort to some form of dynamite theory appears to be necessary in order to account for the observed facts."

A New Milling Machine.

Not a few of our readers will at once recognize the identity of the designer of the milling machine which we illustrate herewith. It is the work of Mr. John J. Grant, and the machine is built by the Grant Machine Tool Works, of Cleveland, Ohio.

It is designed for manufacturing operations such as are done on guns, sewing machines, typewriters, bicycles, etc., and



A NEW MILLING MACHINE.

has some new features of special interest. The most striking of these is the plan adopted for vertical adjustment of the spindle. This consists of a cylinder mounted in the solidly cast head of the machine, which cylinder has an eccentric hole through it that is provided with a phosphor-bronze sleeve in which the spindle runs. This is tapered at each end to enable wear to be taken up and end-play is prevented by means of lock-nuts at the rear end. The cylinder, or perhaps we should say the eccentric, is rotated by means of worm teeth formed upon its exterior, and these are engaged by a worm which is on a shaft passing transversely through the head and having a crank-handle, as seen at the left. In this way the spindle is set at any desired hight from the table, and when set is clamped solidly in position.

The spindle is driven by a spur gear from the cone shaft, which is concentric with the cylinder, and therefore does not move when the spindle is moved for adjustment. The ratio between cone pulley and spindle is 2 to 1. At the inner end of the cone pulley is a small flanged pulley, from which the feed drive is taken and four changes are provided for, ranging from 0.041 to 0.141 inch per revolution. The footstock support will be readily understood from the engraving, and it will be noticed that it is readily removable when not wanted.

The arrangement of the feed motion is shown in Fig. 2, wherein *a* is the feed shaft, having upon it the worm shown and provided with a drop trip. The shaft *b*, which is driven from *a*, is supplied with a crank-handle, seen in front of the machine at the right in the photograph, the feed being thrown in by lifting the projecting, handle-shaped end of shaft *a*, seen at the extreme right of the photo near the bottom of the bed. The crank-handle above this is attached to the screw *c*, Fig. 2, by which lateral adjustment of the table is effected, and this is graduated to thousandths of an inch.

It will be noticed that a bull wheel is introduced, by means of which the rack is carried above the slide and as near the work as possible. This wheel is an idler and runs on a stud located in line with the adjusting screw *c*, but independent of it.

The spindle has the same hole as the B. & S. No. 2 Universal machine, and is threaded to take chucks or face mills.

The cone steps are 5 inches, 7 inches, 9 inches and 11 inches diameter for a 2-inch belt. The extreme hight of center of cutter spindle from the platen is 6⅝ inches; the platen is 7 inches wide, 26 inches long, and the machine will take a cut 16 inches long.

▲ ▲ ▲

A Diminutive Direct-Connected Electric Generator.

The direct-connected electric generator came in with large sizes—the belted machine remaining as the standard construction for small sizes. In some locations, however, notably in the navy, the belted construction is objectionable on account of the room occupied, and the accompanying illustration shows a small direct-connected machine intended for use on shipboard or wherever compactness is desirable, several of them having been supplied to the navy for torpedo boat service.

That the machine is of rugged construc-

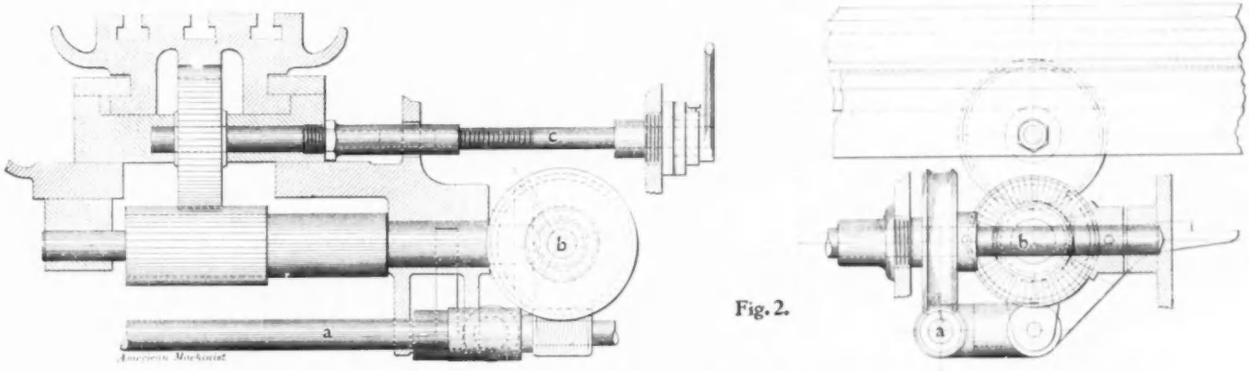


Fig. 2.

FEED MECHANISM OF NEW MILLING MACHINE.

tion the engraving testifies for itself. In this and other respects, such as the provision of sight feed lubricators to all bearings, it is designed for continuous and hard service. The size may be judged from the fact that the cylinders are 2x2 inches, the engine being designed to develop 3 indicated horse-power under 200 pounds steam pressure and at 1,000 revolutions per minute, though intended to be operated at a somewhat less output. The weight of the entire machine is but 400 pounds. The dynamo is of the four-pole type with two field coils, two of the poles being of the consequent type, the rated capacity being 1.5 kilowatt. Air ducts are provided in the armature, so that it acts to a certain extent as a centrifugal blower, and is thus thoroughly ventilated. The back of the armature is closed, partly to make it oil proof and partly to draw the air through the commutator.

This "Midget" set, as it is called, is the product of the B. F. Sturtevant Company, of Boston.

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Letters from Practical Men.

Variable Speed Coupling.

Editor American Machinist:

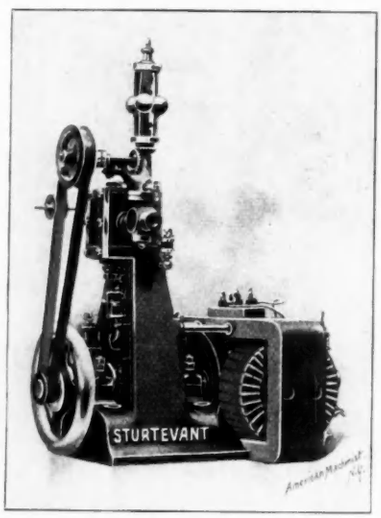
There is nothing so tantalizing, and nothing so well calculated to bring the inventing fraternity under a cloud, as an invention sprung upon the world with an essential link omitted. The difficulties attending the application of the explosive engine to vehicle propulsion are well known, and are the occasion of much brain-racking among inventors; but it is necessary to point out that the solution embodied in the variable speed coupling described in the "American Machinist" of November 17, novel and interesting as it is so far as it goes, yet stops considerably short of being a complete mechanism for the purpose.

The principle which distinguishes it from other devices for the same purpose, including the speed cones which it is designed to replace, is that the difference between the relative speed of the axle *g* when the internal gear *e* revolves, and its maximum relative speed, with brake on *e* tight gripped, is absorbed as power by the brake without disturbing the speed of the engine.

To understand how this is effected, let us assume—what is evidently intended—that the engine drives the shaft *a* with a constant force or turning moment. This turning moment or torque, being transmitted through the hub *b* to the studs of the pinions *d d*, exerts on these a tangential force of a certain number of pounds. This force, being applied at the teeth of the external gear *f* and the internal gear *e*, is divided equally between them; whence the rotation of the latter against the brake consumes work equal to its velocity at the pitch line, multiplied by half the driving force at the studs. Again, the pitch-line velocity of *e*, at any speed, is equal to the pitch-line velocity of *f*, plus 2x (velocity of studs minus pitch-line velocity of *f*), which is easily seen by imagining *f* to be stationary. Then cancelling the pitch-line velocity of *e* = twice the velocity of the studs, which is supposed constant, minus the pitch-line velocity of *f*; whence the sum of the pitch-line velocities of *f* and *e* are constant; and, as each gear is driven by its own constant force, we see that the absorption of energy at the brake on *e* is sufficient to keep the axle speed well in hand.

The defect of this arrangement, as it stands, is that it will operate as intended only when the traction resistance is constant. Any increase of load on the axle *g*, as from a bad road or an up grade, will necessitate a greater force on gear *f* to overcome it. But the speed coupling is not designed to increase this force, and consequently gear *f* will stop turning and transfer its share of the velocity total to gear *e*, when any attempt to start the carriage by tightening the brake will stop the engine. Moreover, if the vehicle strike a particularly good piece of road, or a down grade, the resistance to *f* being lessened, gear *e* will stop turning, and the carriage will run away. If the rider save himself from disaster by releasing the brake, the engine will run away. By all the rules of prudence, therefore, the mechanism should be supplemented with means for varying the torque at will.

Fortunately for the honor of the craft, this can be done without departing from the original principle of the invention. The motor should be made powerful enough to meet the heaviest demands when running at the speed designed. It should then be equipped with a second and similar brake directly on the flywheel, whose function it would be to keep the engine from running away when the traction load is lightened; and this should be of capacity equal to absorbing, if necessary, the whole power of the engine. These brakes, as their functions are wholly distinct, and sometimes one or the other and sometimes both will be used, should be so controlled as to afford the minimum chance for confusion; one, for example, by the right hand and one by the left foot, while the left hand grasps the steering lever and the right foot rings a bell or applies the tire brake.



THE "MIDGET" GENERATOR SET.

The designer will naturally turn to the well-tried Prony type as the one best suited to both purposes; and with interchangeable sets of hard-wood blocks, a few dozen sets being furnished to each purchaser, this should be highly successful. Two or three sets should be carried on every century run, and the prudent automobilist will not start out without a sufficient can of soapsuds, for cooling and lubricating his system of brakes.

I have not touched on the probable horse-power required, on the construction and strength of the carriage, or on the matter of fuel and water supply, as the answer to these and other questions of detail will readily suggest themselves. Before leaving the subject, however, I will suggest that, to make the apparatus a complete and flawless success, the inventor ought to do one thing more. He should invent a public that is likely to pay for it. IXION.

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Editor American Machinist:

In your November 17 issue is shown a geared coupling which is offered as an improved substitute for the variable speed gearing mostly used with gasoline or oil motor carriages. While there is no doubt it would produce the variable speed claimed, it would be done at such a large loss of power as to make it useless for the purpose suggested.

The main object in having changeable speed gearing on such motors is to permit a change of the gearing ratio, thus increasing the torque in the same ratio that the speed is reduced, so that hills may be climbed or bad roads traveled with a motor just large enough to propel the car at its highest speed on a level road. When such gearing is not used, and the speed ratio cannot be varied, the motor must be large enough to do the maximum work required, and that is not allowable on account of the great weight and lack of economy when running at the most used speed.

In the coupling described by Mr. Clegg the gearing ratio is constant for all speeds, and consequently the torque of the driven shaft *g* is the same for all

speeds. We will assume the gearing ratio to be 4, and then if shaft *g* is not rotating the internal gear *e* will make 4 revolutions to 1 of shaft *a*, or if wheel *e* is held fast, shaft *g* will turn 4 to 1 of *a*. If it is desired to have shaft *g* turn at same speed as shaft *a* the brake must be applied and wheel *e* reduced to 3 turns to 1 of *a*, and then three-quarters of the transmitted force will be absorbed by the brake and one-quarter by shaft *g*. If wheel *e* is held fast by the brake then no force is lost, as it all goes to shaft *g*, but as this shaft then turns 4 to 1 of *a* it takes all the force saved to make the 3 additional turns of shaft *g*, and the torque remains exactly the same. The device reduced to its elements is simply a friction coupling, in which the speed is reduced by allowing it to slip, and the loss of force dissipated in heating the sliding surfaces is in exact proportion to the reduction in speed. It is similar to a series electric motor controlled by a variable resistance in the circuit which wastes force by heating the rheostat just in proportion to speed reduction. A simple friction coupling, with a means of varying the pressure while running, would be simpler, cost less and be just as efficient as the geared device.

BELL CRANK.

[To put it briefly, with this device the motor must have, and always exert, sufficient power to drive the carriage at full speed up the steepest hill, and any reduction, either of speed or grade, is accompanied by a waste of the power not usefully employed.—ED.]

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A Kink in Forging Straps.

Editor American Machinist:

The idea here presented is not shown so much on account of its novelty, as probably it is nothing new to many members of the blacksmithing craft, but as an example of good practice which it is well to adhere to in preference to some others that may appear to be less expensive.

One plan may be mentioned which is a solid slab forging machined out to the form desired. These are entirely unreliable under heavy duty, and nearly as expensive when finished.

This forging, which is called a "spade handle" strap for locomotive parallel rods, is a job attended with some difficulty, as it is one required to be absolutely free from poor welds and sand cracks, and it is also desirable that the grain of the iron be parallel, as much as possible to the general contour of the finished piece.

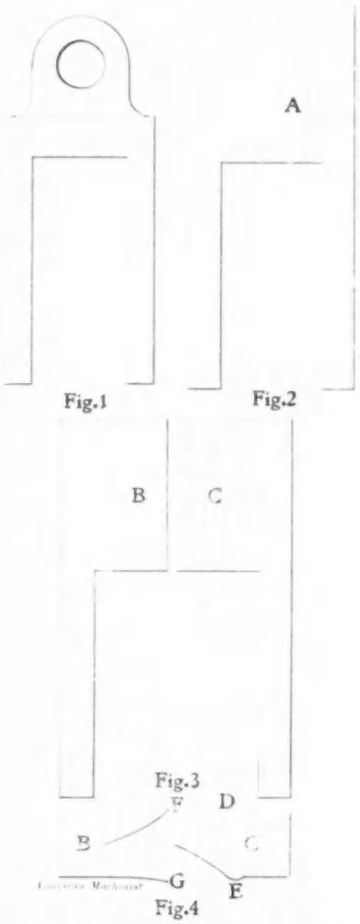
Fig. 1 shows the strap when all finished, and Figs. 2, 3 and 4 show it in process of forging.

This method is one followed in the Fallbrook railway shops, and has proven very reliable with severe usage.

The two parts *B* and *C* are scarfed V shape, as shown at Fig. 4, and at *D* and *E* are two little humps on part *C*.

Now in heating for a weld it is difficult to protect the thin ends from burning, as they heat so much quicker than the heavier parts, and to avoid this the following method is used:

After the parts are forged and scarfed ready for welding they are warmed up to a low red and the piece *C* set in place on *B*, and the two put under the steam



SHOWING METHOD OF FORGING RO STRAPS.

hammer and hammered solidly into place.

Then with the weight of the hammer on the two, the ends *F* and *G* are battered over the humps *D* and *E*, thus holding the two parts together and leaving the strap in the condition of Fig. 2.

The heat for welding can now be safely taken, as there are no thin parts exposed in a way that renders them likely to be burnt.

FRED. E. ROGERS.

Corning, N. Y.

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"See That Hump?"—A Defense of the Patent Office.

Editor American Machinist:

There is never so captious a critic as the one who might have a much wider knowledge of the subject he criticises. If the critic of "that hump," who voiced his grievances in your issue of November 17, had studied the records of the Patent Office, as have its officials who acted on the "hump" hook, he would have found the following facts: That "that hump" is as old as September 18, 1840, being shown in French patent No. 77,941 of that date; that DeLong invented only the *particular* hump hook which his company has so widely advertised, and that what brought it into prominence was an automatic machine for making it, invented by Manville, and patented February 7, 1893 (No. 491,289), in which patent the hook itself is not claimed, and that the DeLong patent *claims* only "A hook comprised of a hook proper and a shank formed of substantially parallel bars, and a tongue having its free end forming a loop *coincident with the bend of the hook*, said tongue and loop being intermediate of side bars," which is far from claiming a hook with a hump, which, again, was as old in the United States as July 1, 1851 (Patent No. 8,198). So our critic's "deceased female relative" was using a humped hook which was not broadly new even in this country, and still older in France.

DeLong's patent (No. 411,857) received three actions of rejection and three other actions by the Patent Office before issue; another (No. 462,472) received six successive actions of rejection, and still another (No. 462,473) nine rejections, but the claims which were finally issued in the last named patent have been sustained by the U. S. C. C. of Appeals, in Campbell et al. *v.* Richardson et al. (78 O. G., 1,103). In that case the court said: "Looped or 'humped' hooks were not invented by De Long, but were *very old*. He had taken out patents for *improvements* in them, as the record shows."

Here is where Patent Office critics usually go astray. According to their theory the office having issued one patent for an invention it ought never to issue another in the same field. To them it is incomprehensible that two devices may *look alike* and still be different in essence and in the scope of the claims covering them. Fortunately for progress in the mechanic arts, the Revised Statutes (Section 4,886) do permit the Patent Office to issue patents for improvements, and upon this, rather than the advice of self-appointed critics, it relies for its authority.

The courts, too, are a legitimate source of authority for the office, and they have enunciated the doctrine of "double use," which is well set forth in Roberts *v.* Ryer (91 U. S., 157), where Chief Justice Waite said: "It is no new invention to use an old machine for a new purpose. The inventor of a machine is entitled to the benefit of all the uses to which it can be put, no matter whether he had conceived the idea of the use or not." If a "locomotive pilot" had been used to take

wrinkles out of a web, it was not patentable to use it "to put a crimp in."

Nothing human is infallible, but the Patent Office is not employing all its time and energies in making egregious blunders. If people must criticise it would be comforting to have them direct their criticisms in the right direction, and it might be well for them to recall the saying of the late lamented Henry W. Shaw to the effect that "It iz better knot to no quite so mutch thann to no a lot that ain't so." NOVICE.

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The Nineteenth Annual Meeting of the American Society of Mechanical Engineers.

The society was called to order, according to program, at 9 P. M., of November 29, with President Hunt in the chair. Preceding the hour set for the meeting, and in fact during the afternoon, the members had gathered in the society house in increasing numbers, and occupied themselves in the renewal of acquaintanceship.

The only formal business of the session was the reading of the

Address of Retiring President Hunt.

The annual presidential address related in a broad and general way to the life, duties and pleasures of the engineer. Starting with Tredgold's classic definition of the engineer as "one who is skilled in the application of the materials and forces of nature to the uses of man," Mr. Hunt proceeded to discriminate between the two classes of engineers—the engineer of the user and the engineer of the maker—and to draw a comparison of the work of one of the former class, represented by the city water works engineer, and one of the latter, represented by the engineer of the builder of the pumping plant under specifications drawn by the former. Noting first that the instruction of the engineering colleges meets the wants of the former, but not of the latter, he proceeded to say that much more detailed and accurate knowledge is required by the latter, and to contrast European with American methods, the tendency of the former being to exalt the engineer of the user and to largely eliminate the engineer of the maker, while the tendency of American methods is the direct reverse—the specifications drawn up by the American engineer of the user being of a general character, intended to cover the results sought only, while the actual design to achieve these results is the work of the engineer of the maker.

Following this the great growth during recent years of the equipment of the laboratories of our engineering schools was touched upon, and some general suggestions were made for increasing their usefulness.

The subject of scientific societies was then taken up and handled in a highly suggestive manner. First paying a high tribute to the ability of the engineers and mechanicians of former ages, the author pointed out that the essential reason why the knowledge and experience of these great masters died with them lay in the fact that the absence of scientific societies denied them the means of transmitting their knowledge to posterity. Proceeding with a sketch of the origin and character of the early scientific societies, he pointed out their great usefulness as now organized, saying that "until attention is called to the subject, we are not likely to realize that in their essential parts the great bulk of the engineering data available to us now have been first presented to a scientific society, and there permanently preserved until the time came for their utilization or application. It is this great fund of information, principally accumulated during the last century, that we draw upon for the materials for our text books, our general treatises and our engineering handbooks."

Following this Mr. Hunt sketched the conditions surrounding engineering in this country in the early days, and the transformation not only of great industries but of the conditions of daily life which had resulted from the engineer's labors, and closed his address with a striking summary of the effect on the mind and character of dealing with the unchanging laws of nature and on the pleasures of an engineer's life, due to the fact that ultimately his work is judged, not by fallible human standards, but by the infallible laws of the universe.

Following the address, which was received with warm applause, the members adjourned to the lower floor of the society house, where a light luncheon was served.

Wednesday Morning Session.

The annual business session was first held, the first item of business being the reading of the

Annual Report of the Council.

This report stated that the council had appointed a committee to confer with similar committees of the American Railway Master Mechanics' and the Master Car Builders' associations on the subject of Standard Pipe Unions, but that the work of the committee had been so interfered with by military and naval duties during the war with Spain that it had no report to make. A committee had been appointed to consider changes in the requirements for admission to the society, with a view to the amendment of the existing regulation whereby the veto power on any candidate is vested in a small and constantly diminishing percentage of the membership. The council has also appointed a committee to consider and report on the standardization of the methods of testing steam engines. The committee appointed to conduct, with committees of other organizations, a series of tests on fireproofing materials was reported to have resigned because of the funds available for the conduct of the tests having been exhausted.

The receipt of a communication from the British Institution of Civil Engineers extending the courtesies of the institution's house to such members as might visit Europe during the exposition of 1900 at Paris was announced.

The summary of membership shows a total of 1,881 members of all grades in good standing.

The annual balance sheet shows the total receipts for the year just closed to have been $32,406.87 and the total disbursements $31,755.82, with $3,364.67 due and collectible.

The change in the requirements for admission of foreign members of which notice was given at the meeting of last spring, was adopted with slight verbal changes. The old requirement by which the applicant must refer to his personal acquaintances among the membership is now restricted to residents of the United States and Canada. Outside those countries this requirement is waived and the council is authorized to indorse an applicant without personal acquaintanceship, but upon satisfactory evidence of eligibility.

The reports of committees being called for, the first to report was that on the testing of materials through Mr. Henning. He stated that the society had assumed membership in the international association, and that through its influence an American section of the association had been formed, which included nearly all the American investigators in this branch of inquiry as well as several of the most prominent American steel works. Following this came the

Report of the Committee on the Revision of the Society Code of 1885 Relative to a Standard Method of Conducting Steam Boiler Trials.

This report, presented by the chairman of the committee, Mr. Hunt, is of course very voluminous, covering, as it does, fifty-three pages, with a number of appendices of the original code to be still incorporated with it. The new code differs from the old chiefly in its provisions covering the use of the recent throttling and separating forms of calorimeters, the determination of the calorific value of coal, the statement of the efficiency of the boiler, and the analysis of the flue gases. The practice of the old committee in adding appendices by various members, signed by their initials, and covering the forms of apparatus preferred by them and observations on various points and precautions which seem to them important, is retained.

The discussion of the report was short—perhaps due to the fact that it had been

in the members' hands but a few days. As the next volume of transactions will cover this and the meeting of next spring, it was decided to hold the report for final action by the membership at that meeting, since no delay in its final publication will thereby be incurred and a better opportunity for its adequate discussion will then be presented. The preparation of standard blanks for boiler tests, to be in accordance with the code, and to be sold by the society, was suggested, as well as provision for presenting the results in both English and metric measures.

The report of the Committee upon a Standardization or Unification of the Methods of Testing Steam Engines was read in abstract from manuscript by the chairman, Professor Jacobus.

The report of the tellers of election showed that the official slate had been elected. On the announcement being made, the chair appointed Past Presidents Warner and Billings a committee to conduct President-elect Melville to the chair, which was done amid great enthusiasm. The president-elect made a few remarks testifying to his high appreciation of the honor done him, which was followed by some remarks by members to the effect that the society had honored itself by its selection.

At this point a discussion arose regarding the action of the Publication Committee in admitting to the "Transactions" papers which were considered unworthy of a place there, to which some members of the committee addressed themselves in reply, and following this some remarks were made regarding the need of some action to draw out the younger element of the society through special junior meetings or otherwise, as it was felt that many able men of the younger set were hiding their light under a bushel through undue modesty. On motion the matter was referred to the council with power.

The business session being closed the reading of papers was taken up, the list being headed by two on fly-wheels which were discussed together. The first was a

Note on the Strength of Wheel Rims,*

BY A. K. MANSFIELD,

in which in a few words the commonly ignored fact that the addition of ribs to the edges of fly-wheel rims might be a source of weakness instead of strength was pointed out. The author's own construction, in which a single deep rim was employed at the center of the width was also shown. The second paper, on

The Bursting of Small Cast-Iron Fly-Wheels,

BY C. H. BENJAMIN,

was a most admirable and praiseworthy one. It records the results of tests on seventeen model wheels, some of which were 15 and others 24 inches in diameter. They were of three types, solid, jointed with flanged and bolted joints, and jointed with links shrunk on, the joints being in all cases half way between the arms. The wheels were all scale models of actual fly-wheels designed by reputable firms, and one of the objects of the tests was to determine the soundness of the theory that in jointed wheels, having the joints placed between the arms, the bending strains, due to the centrifugal force acting on each segment in a manner analogous to a girder under a bending load, may be a serious factor and reduce the strength below that calculated in the usual manner, and it should be said that the soundness of the theory was amply substantiated by the experiments.

The wheels were tested to destruction by speed, the motive power being a Dow steam turbine. For safety of the experimenters and the surroundings, the wheels were placed inside a shield of 12x12-inch oak timbers, which was, however, split repeatedly, the experiments being, according to the author, "at times a trifle too exciting"—a remark to which the half-tones incorporated in the paper lend substantial testimony.

The solid rim wheels, of full strength of section and six arms, broke at rim speeds varying between 385 and 430 feet per second, the wheels with bolted joints running down to 184 feet per second, while the two with shrunk on links failed at 290 and 320 feet per second, respectively—the first wheel having two links to each joint and the second three. In these wheels it should be noted that while the strength of the rims calculated on the simple centrifugal force basis was considerably in excess of that of the links, nevertheless the rims broke in both cases, while the links held intact.

The author's conclusions are:

1. Fly-wheels with solid rims, of the proportions usual among engine builders and having the usual number of arms, have a sufficient factor of safety at a rim speed of 100 feet per second if the iron is of good quality and there are no serious cooling strains.

In such wheels the bending due to centrifugal force is slight, and may safely be disregarded.

2. Rim joints midway between the arms are a serious defect, and reduce the factor of safety very materially. Such joints are as serious mistakes in design as would be a joint in the middle of a girder under a heavy load.

3. Joints made in the ordinary manner, with internal flanges and bolts, are probably the worst that could be devised for this purpose. Under the most favorable circumstances they have only about one-fourth the strength of the solid rim, and are particularly weak against bending.

In several joints of this character, on large fly-wheels, calculation has shown a strength less than one-fifth that of the rim.

4. The type of joint exemplified in Nos. 16 and 17 [of the familiar rolling mill style, with joints connected by steel links shrunk on over cast iron lugs] is probably the best that could be devised for narrow rimmed wheels not intended to carry belts, and possesses when properly designed a strength about two-thirds that of the solid rim.

This paper brought out an animated discussion, in which it was pointed out by Mr. Carey that there was scarcely a reputable steam engine builder in the country who did not have broken fly-wheels to his credit, showing that the accidents could not be attributed to careless design. He considered that other causes than excessive speed were frequently, if not usually, the cause of failures, among these causes the abrupt application and release of the load being prominent. He had kept records of a considerable number of fly-wheel accidents, of which the causes were known, and among them such cases as the keys of the governor gears working loose, the clogging of the gearing through the catching of waste in wiping, and similar causes, were prominent. Mr. Stanwood suggested the advisability of experiments on wheels having the joints one-quarter of the distance from one arm to the next, instead of half way between—that being the point of contrary flexure of the rim—and Mr. F. R. Jones suggested experiments on wheels suddenly stopped from high speed.

With some difficulty Mr. Fritz was prevailed upon to speak, and he said boldly that there was no excuse for any fly-wheel letting go. He had been associated with rolling mills for sixty years and had designed a very large number of fly-wheels for this service, which is the most severe of any known, and in all this wide experience he had never had a wheel fail. The starting point of his design is a hollow rim, which he provides partly to get a greater depth of the rim to provide for greater strength of the sections considered as beams, and partly to get thin sections of metal instead of thick masses, of which the center adds its full quota of weight but very little strength. The arms he also preferred to make hollow, though he had made some of I beam section. Each arm was cast with its section and the joints were half way between the arms. The joints were made with shrunk links of the I pattern, with the special provision that the links varied in length, so that at any one section the section of the rim should be weakened by the recess for one link head only. Even this weakening, he pointed out, can be largely if not entirely prevented by making the core smaller at

* Printed copies of any paper may be obtained at small cost by addressing the secretary of the A. S. M. E., 12 West Thirty-first street, New York.

the ends where the links are located. In other words, while a solid rim must be weakened at the joint by the metal cut out for the links, a hollow rim may be reinforced at this point by additional metal on the inside, so that the joint shall be substantially as strong as the solid part of the rim. Another point about which he was very particular was to have his wheels run true—"a wobbling wheel is a dangerous wheel."

The remarks of Mr. Fritz were listened to with marked attention and produced a decided impression. After the session remarks were common that here were ideas on fly-wheel construction of the highest value. The fact that in Mr. Fritz's great experience no fly-wheel of his make had ever failed, although subject to the most severe duty, was felt to be one that could not be ignored.

The president's reception at Sherry's Wednesday evening was by common consent even more enjoyable than similar events have usually been in the past, and did not break up until a late—or early—hour.

Thursday Morning Session.

This session was devoted exclusively to the reading of papers, of which the first was on

The Theory of the Moment of Inertia,

BY C. V. KERR.

which paper was a more complete presentation of the ideas embodied in a former paper by the same author. It is quite mathematical and relates to the moment of inertia in its true or dynamic sense, and not to the expression used in the discussion of the strength of beams, and universally miscalled the moment of inertia.

A table of formulas of moments of inertia for several elementary forms is given and a graphical method for finding the quantity for bodies of such form as not to yield to analytical treatment, the accuracy of the graphical method being tested by applying it to a body of such form as to be capable of being handled analytically, and then comparing the two methods.

This paper was discussed by Mr. Kent and Professor Kingsbury. The former objected to the paper as an unnecessary piece of work, which brought out no new facts. He contended that the moment of inertia of its author was a new thing, different from the geometrical and dynamic moments of inertia, as already understood, and as such it should have a new name if it was worth naming at all. Exception was taken to the author's Conclusions I., II. and III. Professor Kingsbury objected to Conclusion IV.

The second paper was entitled:

Improvements in Steam Boilers and the Brick Settings of Same,

BY W. BARNET LE VAN.

This is a fully illustrated description of a boiler and setting recently erected by the author. It is of the horizontal tubular type, with a superheating steam drum and some modifications in the setting designed to secure smokeless combustion.

The paper concludes with a table of results from a test of one of these boilers by Geo. H. Barrus, in which the evaporation per pound of combustible from and at 212 degrees ranges between 11,071 and 11,388 pounds, its results varying with the kind and mixtures of coal used, of which there were five. Some of the tests were with anthracite and some with bituminous coal, but nothing is said in the report regarding the results as regards the quantity of smoke.

A paper on boilers has usually about the same effect on this society as that of the traditional red rag on a bull, and this one proved to be no exception to the rule.

Mr. F. W. Dean in a written discussion said that the paper contained many things that were not true, and in general it was very misleading. Mr. Kent objected to the paper because the boiler was neither new nor good, and because it had already been published in full by the author. He considered that the paper was an improper one to appear in the transactions of the society. Mr. Rockwood considered that the author was a bold man at this date to take up the defense of the five tube boiler.

In his rejoinder Mr. Le Van stated that the paper had been prepared by the request of the secretary, and considered that because the boiler was not new was no reason why it was not good.

Following this came a paper on

The Generation and Utilization of Steam by the Lykens Valley Coal Company and the Summit Branch Coal Company, Dauphin County, Pa.

BY R. VAN A. NORRIS.

This paper is essentially a report made by the author on the condition of the steam plants of the two anthracite mining plants named in the title. Although no greater changes than repairing the lines, setting valves, etc., have been so far made in the plants, the results have been the shutting down of twenty boilers at one and six at the other. The paper is accompanied by numerous plans and tables, as well as indicator diagrams, which latter are as a rule horrible examples of steam using, and are an eloquent commentary on the steam practice prevailing in the anthracite regions.

In the discussion Mr. Allison defended the direct acting steam pump, and stated that those who condemned the pumping practice of the anthracite regions had no knowledge of its difficulties. He said that if the anthracite miners could sell their mine water and throw away their coal the industry would be in a better condition. Mr. Wheeler said that the gain due to compounding a steam pump was much greater than that due to compounding an engine. By compounding a pump one-half the coal could ordinarily be saved, and under favorable conditions more than that. Mr. Ashworth thought the tests full of assumptions and uncertainties. Mr. Supplee said that the saving in fuel was not the only saving due to the use of high grade steam machinery. He had known cases in sawmills where the fuel was waste, in which the savings in attendance and in other items had paid a good return on the cost of high grade machinery.

Following this paper came one on

The Valve Gear of the Willians Engine,

BY JOHN SVENSON.

This description of the Willans engine valve gear is the first which we have noticed on this side of the Atlantic. Its remarkable simplicity is very apparent from the illustrations and description, and its action is shown by some sample indicator diagrams.

There was but little discussion on this paper. Mr. Nagle thought it should include a full analysis of the movements for critical study. In reply the author said he would have been glad to include such an analysis had he supposed it would have been acceptable. In reply to a question he said the rotative speed of these engines varied between 300 and 500 revolutions per minute. Owing to the short stroke the piston speed, however, was low—about 500 feet per minute.

The succeeding paper was on a

Cooling Tower and Condenser Installation,

BY J. H. VAIL.

This paper describes the changes in an electric light station whereby increased power and economy were obtained from the installation of a condenser and Barnard cooling tower. The station comprised twenty-seven boilers, 48 inches in diameter by 20 feet long, and, increased capacity being required, plans had been prepared and estimates made for enlarging the building and adding more boilers. At this point the author of the paper was called in and advised the installation of a condenser and cooling tower in lieu of adding to the boiler plant, calculations having shown that the desired increase of capacity could thus be obtained from the existing boilers with the economy due to the condenser in addition.

No comparative tests of the cost of the power before and after the change have been made, but the paper states that the station capacity has been increased by about 1,000 horse-power, while the boiler plant, which before the change had been fully loaded, now supplies steam for the additional work and with boilers to spare.

In the discussion Mr. Wheeler explained the action of the condenser pump, which is of the twin type, but one of the cylinders handles the water, extracting it from the condenser and elevating it to the tower, while the other takes care of the

vapor and air. This arrangement is used to avoid the losses due to elevating the water to the tower by the usual form of air pump. He also discussed the use of oil filters in connection with surface condensers. He said they were entirely successful if properly operated. The user should be content to save about two-thirds of the water, and should fill his boilers afresh about once a week. The condensed water should not be used at all while the plant was new, or until the amount of oil fed to the cylinders had been cut down to the permanent figure.

The next paper was on

Methods of Testing Indicators,

BY D. S. JACOBUS.

This paper calls attention to the discrepancies between tests of the same indicator spring when made by different methods, and states positively that the method of testing by a mercury column is unreliable. The apparatus used at the Stevens Institute is shown and the statement is made that with this apparatus and with the indicator in proper condition the lines for the same pressure, but with tests on rising or falling pressures, are coincident.

The author explained that this paper had been prepared in connection with the work of the Committee on Standardizing Steam Engine Trials, as it was felt that the subject of indicator testing was important in that connection.

The next and last paper of the session was on

The Variation of Belt Tensions with Power Transmitted,

BY W. S. ALDRICH.

This paper is an examination of the well-known experiments on belting made by Wm. Sellers & Co., and reported in a former paper to the society by Wilfred Lewis. The paper first points out the manner in which these experiments upset the theoretical formulas and conceptions regarding belt action which had prevailed before the experiments were made, and then proceeds to put the experiments as curves and to find an empirical formula which shall fit them.

A written discussion was presented by Mr. Wilfred Lewis, who objected to the author's deductions, especially his attempt to formulate a law for the varying sum of the belt tensions. This was a function of the catenary action of the slack side of the belt, and no formula could be correct which did not take this into account, which would necessarily include the distance between the pulleys as a factor. The increase of the sum of the tensions with increase of load in vertical belts he considered to be due to the probable fact that the modulus of elasticity for belts was not constant, as had been assumed in the old theory, in which the sum of the tensions was supposed to be constant. Mr. Lewis also submitted a diagram made by Wm. Sellers & Co., which was the practical outcome of their belt experiments.

Mr. Barth stated that he had arrived at the same conclusion as Mr. Lewis regarding the reason for the increase of the sum of the tension with increase of load, and he had found that the formula

$$T_1^{.65} + T_2^{.65} = 2\ T_m^{.65}$$

in which

T_1 = tension of tight side
T_2 = tension of slack side
T_m = tension of each side with belt at rest agrees exceedingly well with the curve plotted by the author from the Sellers experiments.

The truth of this formula needs to be tested by experimentally determining the law of the variation of the modulus of elasticity of leather and the belting material.

Thursday Afternoon Session and Excursion.

The excursion which had been planned for this afternoon to the works of the John Stevenson Company had to be abandoned, and in place of it was substituted a preliminary lecture illustrated with lantern slides by Mr. B. C. Batcheller, on his system of pneumatic postal tubes, which was followed by a visit by the society to the General Post Office, where the apparatus of that station was shown in operation. After viewing the apparatus and machinery a portion of those present proceeded to the Eighth street and Third avenue branch post office, where a set of apparatus suitable for such a station was seen. The event was a most enjoyable one to all.

Following the lecture by Mr. Batcheller, and preceding the visit to the post office, an event which was not on the program took place. This was the unveiling of a half-length oil painting of Mr. John Fritz in the audience hall. The speech of the occasion was by Mr. R. W. Hunt, and was most fitting and appropriate. The warmest applause greeted the speaker and there were many expressions of the warm regard in which Mr. Fritz is held by the entire engineering fraternity.

Thursday evening the society was entertained at the house of the Engineers' Club. The entertainment consisted chiefly of an exhibition of lantern slides from photographs of scenes connected with the hunting of large game in Africa and was much enjoyed by all.

Friday Morning Session.

The opening paper of this, the concluding session, was on

The Calorific Power of Weathered Coals,

BY R. S. HALE AND HENRY J. WILLIAMS.

This paper records the results of tests on coals, of which samples of each kind tested had been sealed up, while companion samples had been exposed to the weather for a period of eleven months. At the end of this period the samples were tested, both by chemical analysis and by the Williams bomb calorimeter. The number of British thermal units were calculated from the analyses by the formula suggested by the society's boiler committee, and were also determined from Kent's curve, the results of the various determinations being given in a table. The conclusions drawn are:

1st. That weathering decreases by about 2 per cent. the theoretical calorific power, as calculated by Dulong's formula.

2d. That weathering decreases by about one-half of one per cent. the actual or true calorific power, as shown by the three results obtained with the bomb.

3d. That if the results calculated from the above analyses are interpolated from Kent's curve, which is based on the percentage of fixed carbon, as determined by proximate analysis, the latter being a more or less variable quantity according to the age and degree of exposure of the coal, the remarkable result is obtained that the weathering of a sample of coal increases the percentage of fixed carbon in the combustible, and also increases by about one per cent. the calorific power of the coal.

In the discussion Mr. Kent claimed that the original claims made for his curve are substantiated by all of the tests except one, in which he claimed there was an obvious error in the analysis.

The next paper was on

The Mechanical Plant of a Modern Commercial Building,

BY WM. B. BRYAN.

This paper opens with a statement of the leading problems involved in laying out the mechanical plant of a modern commercial building, and follows this with a description, together with the methods employed by the author in designing a plant belonging to a large building recently erected in St. Louis. The character of the specifications, the method of asking for tenders for different parts of the work, and the various considerations on which decisions regarding types of machines, etc., were based are given. A variety of data are scattered through the paper, which, as an exposition of methods, is of considerable interest to those engaged in the class of work to which it relates.

The paper was more productive of discussion than any of the others, some of the discussions being of the first order of excellence, while other portions of it were marred by a spirit of hypercriticism. The discussion as a whole, extended to almost every feature of the mechanical plants of modern buildings, and was of

such a wide range as to make an intelligible abstract of it impracticable.

Following this came the last paper upon the docket—an account of some

Experiments on the Flow of Steam Through Pipes,

BY R. C. CARPENTER AND E. C. SICKLES.

This paper describes experiments made at Cornell University to determine the frictional resistance of long pipe lines and of elbows and valves to the flow of steam. The conclusions of the authors are embodied in tables for everyday use, which are in convenient form for such use.

The paper was severely handled in the discussion by Mr. Kent, who pointed out that while the coefficient of friction varied with both the diameter of the pipe and the velocity of flow, though by some law on which authorities differed the authors had made no attempt to determine the law experimentally, but, accepting one of several formulas, had applied it to experiments on a single pipe of 2 inches diameter, under a single pressure and velocity, and then calculated the losses for pipes up to 24 inches diameter, and under a wide range of pressures and velocities. This he considered indefensible. Professor Jacobus called attention to a series of experiments made in France, which covered a wide range, and had been published in the "Annales des Mines," and translated and republished in the "Stevens Indicator." The formulas resulting from these experiments had been repeatedly used in the work of the Stevens Institute, and with a very satisfactory agreement with observations.

Following this came a paper which was not on the program entitled

Tests of Fire Hydrants,

BY C. L. NEWCOMB.

This paper was read by the author from manuscript and related to an extensive series of experiments made for the city of Holyoke, Mass., on several commercial hydrants. The author explained that the paper was presented at this meeting in order that it might be officially published before the results were given to individuals for private use. As the members had had no opportunity of studying the paper, discussion of it was postponed until the spring meeting.

The various topical queries on the program were then taken up, the first one being, "Does it pay to pickle ordinary castings?" Replying to this Mr. Newcomb gave it as his opinion that no one could now afford to pickle castings, inasmuch as the sand blast process was so much superior in its results to pickling. Foundries doing inferior work did not like the sand blast, because it disclosed defects in the casting, and the company with which he is connected considered it of very great value.

To the query, "What constitutes a seamless tube?" the opinion expressed was to the effect that the term belonged to the process of manufacture rather than to the finished article, specimens of which when made by welding processes would often have no visible seam. The attempt to apply a term which was originally intended to cover a superior article to inferior goods was deprecated.

The query "Have you any new notions on machine shop floors?" brought several to their feet. Mr. Newcomb considered cyanized 3-inch spruce plank as the proper thing for the ground floor and 3-inch spruce, with 1⅛-inch maple and building paper between as the best construction for upper floors. Mr. Carey also testified to the superior durability of maple. He had put down an experimental floor in sections, one section of spruce, one of yellow pine, one of a superior quality of yellow pine, and one of maple, and while he could not give figures for durability without referring to his notes, the result was that he had abandoned all materials but maple. He called attention to the fact that piano wareroom floors, over which heavy weights supported by small rollers were being constantly rolled, were universally made of maple, that having been found by experience to be best. Mr. Durffee described a ground level floor, which he had made, in which the ground was first covered with broken stone in which chestnut sills were bedded. On these oak plank 4 inches thick and 5 inches wide were laid, with ⅛ inch clear space between the planks. The purpose of the open spaces was to permit circulation of air and also allow water to run off. He did not expect to live to see that floor relaid. For upper floors he used 4-inch plank, laid on girders spaced 10 feet between centers, and covered with hard pine. He considered that flooring should not be tongued and grooved. The material should be selected and have the grain at right angles with the surface, and the planks should be laid at 45 degrees with the main lines of the building, both to stiffen the building and to have the planking at an angle to the line of traffic.

At the conclusion of this discussion a vote of thanks to the Metropolitan Traction Company for providing free special cars for the excursion of Thursday, was voted, and the meeting adjourned.

Perhaps the most striking feature of it was the fact that a set of rather unpromising papers called out discussion of more than ordinary value.

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The Chilian Congress has issued a decree offering a state bounty of $125,000 to any foreign country or firm which will undertake to establish an iron foundry on a sufficiently large scale. Iron ore in large quantities is found in the country.

Core Makers and Their Environment.

BY L. C. JEWETT.

Core-making is a branch of the foundry business too often looked upon as simple, unmechanical, accessory to the production of castings. It would seem that the core-maker, of all the employés, is the least appreciated. As a rule, his immediate surroundings—bench, tools, drying plates, shelves for core boxes and for storage of cores—are of the crudest, and most temporary character. There is usually uncertain and insufficient draft for his oven fire, and if provision is made for regulating the draft it is very liable to be unreachable and ungetatable. To put cores into or take them out of the oven, after drying, requires courage equal to that of a Rough Rider at San Juan Hill. It means, if the oven is hot, singeing of face, hands and hair to a painful degree. If not a quick oven, as the cook books say, it means disappointment, wilting of energies and too often a growl and the laying of the cornerstones of feuds; ofttimes to a scrap there and then with some anxious molder who has a hurry up job or a late cast, or maybe the taking out of a core before it is sufficiently dried, resulting in the loss of the casting. And if lost, who's to blame? "Why that chump of a core-maker," and so on *ad infinitum*. The result of all this is that a self-respecting man with any mechanical ability will chafe and get away from the core bench and core-making as soon as possible. Not because the avocation of making cores is unpleasant of itself, but that the endless nagging and the jarring of his nerves from every side, and the lack of proper fittings and furnishings, render his best, honest efforts futile. If success is the happy result of an intricate and difficult casting never a golden ray of glory scintillates as far as the core-maker. The molder may get a faint ray; if so, he absorbs it all.

As a consequence of this state of affairs, with rare exceptions, the core-making is done by men of soured and combative dispositions, who have developed a "don't-care-a-damn" condition of mind, and are frequently an irritating thorn in the side of the foreman.

Here are a few flowers that could be thrown in the path of these seemingly lightly appreciated toilers:

Plates for Drying Cores.—How few foundries, even those with a machine shop as a part of the plant, have true and straight core plates! How much time has been, is now, and ever will be wasted in putting on molding sand (also wasted) to get a crooked plate to bear, or come near bearing, on the flat joint of a core box, and when every care is taken, the core, when dry, not as true as a straight plate would leave it! How little the cost to have a cut planed off the surface of

each core plate, just enough to straighten it! It is a good investment, in economizing sand, molding and core, also time, in not having to rub cores together to get a joint. Cores will be more uniform and true to size. Be sure that the core oven has good draft with large firepot. Have dampers handy within reach outside, not inside of the oven. Have the racks or shelves inside of the oven straight and stiff, with bars that will carry their load without sagging. If bars across the oven are used, have them rest in notches, so that when fairly heavy plates with cores are put in the oven the bars will not be pushed out of their proper position, letting plate and core, and incidentally the core-maker's soul, go down, down to destruction. Have the fire where it can be replenished easily, the grate where it can be cleaned and raked without a backache or heartache. Have for small cores an upright spindle with revolving shelves. Have the door in two or three parts, so that a portion of the opening can be used when a portion only is wanted, and the whole can be opened if necessary. Then the oven will not be depleted of all its heat each time you open the door. It will save fuel and add to the comfort of all in the vicinity of the oven. Have a deep ash pit, with unobstructed air passage to the grate. The grate can be close between the bars, and, with plenty of area, cinders can be used and produce all the heat required for average small cores at least. Have a roomy bench, good and solid, with roomy bins for core rods and wires, and with drawers for tools, brushes, vent strings, etc.

These, and many more, are provisions for the making of cores that will make an oasis in the core-maker's present desert. The securing of them will enhance his self-respect; he will work more days in the year; turn out a better product and more of it, and there is not a thing in the particulars enumerated but that is in the true way of economy in time and material.

North Attleboro, Mass.

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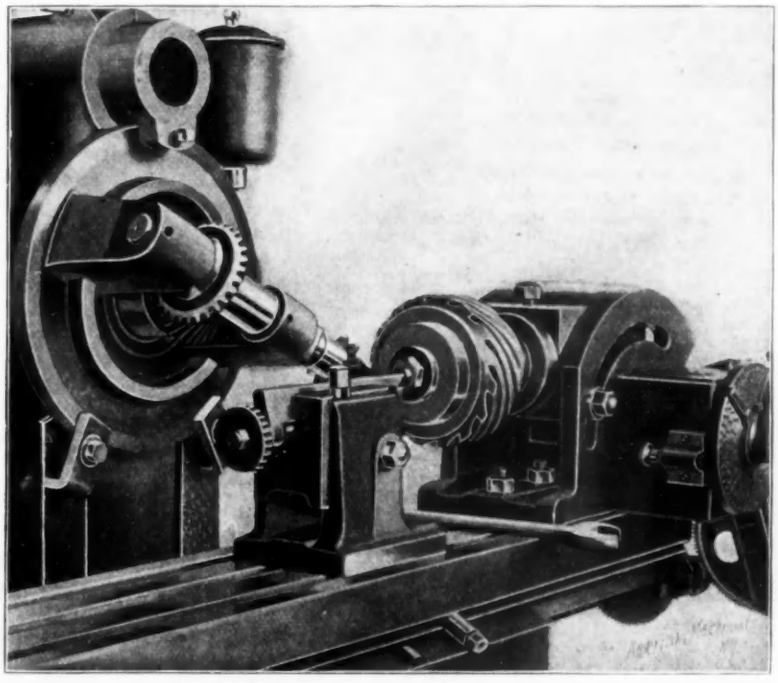
Blasting a Chimney.

Engineering, London, gives an interesting account of the destruction in Hungary of an octagonal chimney 135 feet high, with walls 3 feet thick, resting on a base 16½ feet high, the latter being preserved for the erection of a new chimney. The operations were under the direction of a lieutenant colonel of pioneers. Immediately above the base the bricks were taken out on both sides so that two openings, 3 feet high, were produced, leaving the three faces of the back and about one face and two-thirds in front intact. This was done by four men in nine hours. The chimney was to fall on the ground in front, buildings being too near in other directions. The blasting agent was not put in boreholes, but placed against the outer surface of the pillar which had been left standing in front. In order to spare the base, the "ecrasite," which is essentially picric acid, was fired about 10 inches above the base, one mine charged with 15 pounds of ecrasite being placed on the front face, and two mines of 11 pounds each on the remaining portions of the adjoining lateral faces. The ecrasite was kept in position by sandbags. The three mines were fired simultaneously. The chimney was seen to shake violently, and then to topple over slowly. It fell exactly in the desired direction, and the débris formed a regular heap of the outlines of a bottle, with its greatest breadth of 56 feet at a distance of 66 feet from the base. The external diameter of the chimney was 12 feet, and the base was 17 feet square. From the line of greatest breadth the heap tapered equally in both directions. It had a length of 190 feet, and a minimum hight of 1 foot, about the region of minimum width. The space immediately adjoining the base was clear of fragments, as was to be expected; the base had, however, a crack, extending down the whole front. The bricks from the upper portions of the chimney simply fell apart, those of the lower third being mostly broken. Observers standing on both sides of the smokestack during the blasting did not notice any rush of the air. In the direction of the fall, however, the air pressure was strong enough to break the windows of a house situated at a distance of 260 feet, though not quite in the axial line, and of workshops almost 500 feet away.

Fixture for Cutting Helical Gears.

The subject of making helical gearing is at present an especially live one, and very many mechanics are interested in it. In some cases special facilities are provided for the work, and where this can be done it is of course the best way; but sometimes and for various reasons these are impracticable, and the gears required must be made with little more in the way of facilities than the ordinary shop equipment provides.

As an instance of how this may be done we present an engraving of a universal milling machine rigged up for the work in the shops of the Springfield (Ohio) Gas Engine Company by the foreman of the shop, Mr. Charles F. Endter. As will be seen, the special appliances consist simply of a circular plate clamped in the



FIXTURE FOR CUTTING HELICAL GEARS.

manner shown on the front face of the machine, provided with graduations on its edge to indicate the angle to which the cutter is set and carrying upon its outer face suitable bearings for the cutter arbor, which is driven by the miter gears as shown, one of these being keyed to the arbor, while the other is upon the end of a taper shank inserted in the spindle of the machine.

Arranged in this way a series of angles are obtainable which are not within the scope of the machine as ordinarily arranged, and it is, in fact, applicable to a machine which has no swiveling arrangement for its table. For cutting the gears used on the gas engine made by the above mentioned company it is found to be efficient and entirely satisfactory.

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The Patent Solicitor and the Consulting Engineer.

There is a certain man, who need not be specifically mentioned, but whose name is occasionally appended to articles in the "American Machinist," and who is both a mechanic and a patent solicitor. As a mechanic he has invented a number of appliances and has designed, or practically created, a good many machines that are now in successful operation. As a patent solicitor he does very much as other patent solicitors do—writes descriptions and claims for inventions already made. He likes the business of designing new machinery, of creating or inventing new and better ways of accomplishing results, and he takes much personal satisfaction in the knowledge that machines which have gone out from his hands are superior to their predecessors. But people will not pay for that kind of service. He says that he can get more money for describing some incomplete invention than he can for the far more difficult work of making that invention practical. As a natural result, he prefers the patent practice, though he says that the most valuable services which he renders are those for which he receives the poorest pay.

It is somewhat difficult to explain this on the theory of supply and demand, because patent attorneys are thick in his neighborhood, while equally competent mechanics seem to be scarce. A possible explanation may be found in the fact that while a good many persons really need this higher quality of mechanical service, they do not want it for fear that the man who renders it may steal some of their thunder. They prefer some obscure mechanic, who could not be suspected of furnishing any important ideas. Another explanation may be that a man who has conceived of a certain feature of a new machine often does not realize how much is needed to make that machine practical. It is quite common for such a man to say that he "does not want any designing done; only someone to make drawings of pieces already determined;" therefore, he selects the cheapest draftsman he can find, usually a boy, or someone in an architect's office. Such proceedings may make work for patternmakers, foundrymen and machine shops, but they do not make rapid progress toward success.

A man usually considers as important only that which he can comprehend, and the average business man cannot understand why he should be asked to pay more for a line drawn in a certain direction with 3" written on it than he should for a line drawn in a different direction with 2½" written on it; yet this difference may, and often does, mean the difference between success and failure. The fact seems to be that the mechanical engineer, as distinguished from the inventor of a new device, is in very much the same situation that the literary man of last century was in. There is a need for the best services, but the quality not being understood there is little actual demand. In due course of time, when Mr. Inventor seeks capital, Mr. Capitalist will say: "Go over to Mr. Mechanic and have him put your invention in the best possible shape, and then come back and see me." When that time comes the capitalist will save his wasted money, the inventor will get his improvement quickly before the public, and the mechanic will get a compensation commensurate with the quality of his services.

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The Escape from Fire.

Before we are fairly settled in our new quarters, the most prominent thing now to be seen from the windows of our editorial rooms is the blackened and ruined building from which we have just removed, the floor upon which our rooms were located having been one of those that were most completely destroyed. We have thus been fortunate enough to save from destruction records, files, etc., which could not be replaced, and the loss of which would be serious.

The fire, which has seriously damaged, though not destroyed, one of the most splendid buildings in the city, did not spare our friends, the publishers of "Locomotive Engineering," however. Their offices are completely gutted, and for the present their business is being conducted in our new offices, 218 William street, where they will remain until permanent quarters can be secured.

The fire again demonstrated the fact that there is really no such thing as an absolutely fireproof buil ing. Though it is doubtful if any fire started within the Home Life Building could have seriously injured it, a fire breaking out in a five story building next to it and raging fiercely for hours, proved too much for its powers of resistance, and above the line where the fire struck it the building is in ruins.

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Questions and Answers.

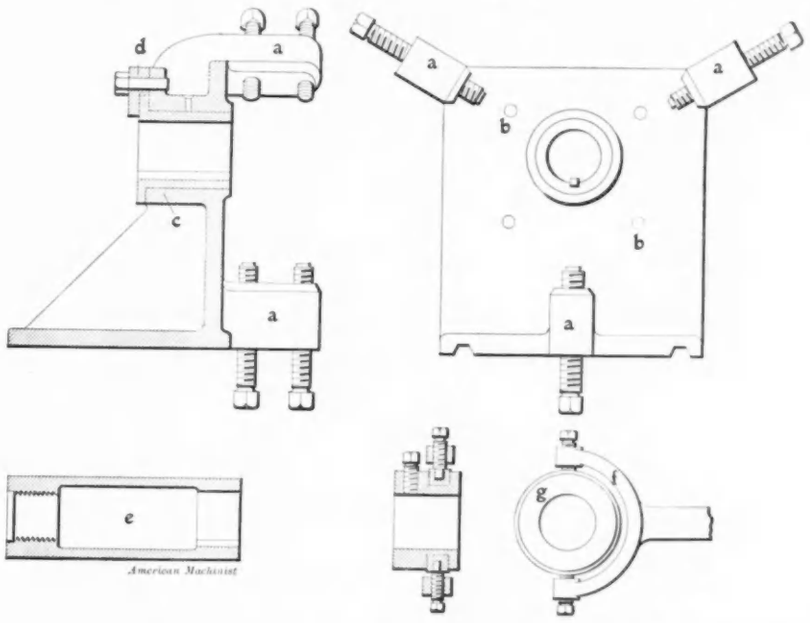
Name and address of writer must accompany every question. Questions must pertain to our specialties and be of general interest. We cannot undertake to answer by mail.

(118) J. G., Frankfort Springs, Pa., writes: "I would like to ask Mr. Fred. E. Rogers, of Corning, N. Y., through your columns, how the blacklead composition is prepared for the rod packing referred to by him in your issue of November 3? A.—To this Mr. Rogers replies as follows: The packing I referred to is the commercial article, which is widely sold, and can be obtained in sizes from ¼ inch to any ordinary size likely to be wanted. If, however, the correspondent cannot obtain it, he can use hemp, or even candle wicking, or the packing which he already has, but worked to a size suitable to the proportions of the sleeve and rod as made for the engine. If hemp or candle wick be used, it will give good results to saturate with oil mixed with graphite (or blacklead as sometimes called), and then roll it up into the suitable size and insert it in a continuous coil to the capacity of the sleeve, instead of cutting in rings, as shown. Your correspondent need have no fear, however, of following his own judgment in this matter, as the most inferior grades of packing work successfully with this rig, for the reasons stated in the article. Springs of comparatively light tension should be used. With a 1¼-inch rod I used a spring requiring about 40 pounds to compress. 2. Can tracing paper be used with as good results as with tracing cloth for making blue prints? A.—If only one print is to be made, and the tracing is afterward to be laid carefully away and not handled, the paper will answer, but for regular use it is not suitable. 3. Is is customary to use a different color of ink for dimensions and lettering on a drawing? A.—No, it can hardly be said to be customary, although it is sometimes done. When red ink is used the corresponding lines on the blue prints are distinguishable only by being somewhat less bright than the others.

(119) J. H. S. writes: I am sometimes asked to decide questions as to the horse-power of engines of certain dimensions, and, for instance, was recently asked to decide in a dispute as to the horse-power of a plain slide valve engine 8⅝ inches diameter, 12½-inch stroke, making 250 revolutions per minute, with a steam chest pressure of 80 pounds. The point of cut-off is unknown, but as-

suming what is customary for such engines, and disregarding piston rod cross-section, what should be the decision as to the horse-power of this engine? A.—The horse-power actually developed by the engine can only be guessed at, though perhaps the guess would be fairly close. Where the point of cut-off is not known, it is usual to assume that the mean effective pressure in the engine is about one-half the boiler pressure. This would make the mean effective pressure 40 pounds, and with this as a basis the engine figures by the Cox computer nearly .37 horse-power.

(120) E. T. O., New Orleans, La., asks us to repeat the article by C. O. Griffin on "Boring 48-Inch Fly-Wheels on a 20-Inch Lathe," which was published in our issue of August 20, 1896, as that number is now out of print. A.—This question was given in our issue of November 17, but in the confusion incident to moving our offices the cuts intended to illustrate it were omitted, and hence we reproduce the entire answer here. The accompanying



sketches are the same as those given by Mr. Griffin, and the following is an abstract of his description: The rig consists of a suitable angle casting properly braced, which is bolted to the tail end of the lathe bed, the tailstock being removed. The three lugs *a a a* overhang the end of the bed, and by means of the long set screws grip the hub of the wheels, which, of course, likewise overhangs the bed, where the swing is only limited by the distance to the floor. The wheels have six arms, as all such wheels should have, and the three lugs project through the alternate arms of the wheel. Each lug having two set screws, the wheel can be readily adjusted to run true by a tram carried by the bar—the adjustment for preventing wobble being assisted by the set screws *b b b*. The hub *c* of the fixture is bored in line with the lathe spindle, and a hardened steel bush is fitted to it, this bush having a flange at one end, which by a clip, retains the bush in place. A boring bar the full length of the lathe is guided by this bush—a key in the bush engaging a keyway in the bar, thereby compelling the bush to revolve and the movement to be at the lubricated joint. The bar is driven by a long keyed sleeve *e* screwed to the nose of the lathe spindle, a key in the sleeve driving the bar, but permitting the lengthwise feed of the bar. This feed is accomplished by a fork *f* carried in the tool post and a ring *g* secured to the bar *b* by a set screw. Suitable tools in the bar bore the hole, and a compound rest from the lathe mounted on the bar by a bracket casting does the facing. The side of the hub selected to be faced in the fixture is the one which it is most important to have true, that is the one next the bearing, and after this side is faced and the hole is bored the wheel is strapped down to a planer and the opposite side of the hub is faced off.

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In our issue of October 13 we stated that Mr. Leon del Monte, residing at Dundee, Scotland, was acting as a sub agent for several firms including the Brown & Sharpe Manufacturing Company. We are informed by the Brown & Sharpe Manufacturing Company, and by Charles Churchill & Co., their London representatives, that they have no knowledge of Mr. Leon del Monte and that he does not represent them.

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Personal.

Robert H. Harrison, who has been forty years in the service of the Pennsylvania, and for many years foreman of the Pitsburg, Fort Wayne & Chicago shops, at Fort Wayne, has been retired with full pay for life.

Mr. Arthur Herschmann, engineer and inventor, has recently accepted a position in the engineering department of Wm. Sellers & Co., of Philadelphia. In addition to mechanical ability, Mr. Herschmann is a capable linguist, being able to speak and write five or six different languages.

Obituary.

George W. Hulme, the representative in Philadelphia of the manufacturing firm of Gilbert & Barker, died in that city December 3, sixty-four years old. He was a native of Lowell, Mass., and there learned the machinist trade. He was for many years connected with the Singer Sewing Machine Company.

John Baizley, proprietor of one of the oldest iron works in Philadelphia, died December 3, seventy-three years old.. He was born in a suburb of Philadelphia and learned the trade of blacksmithing, starting in business for himself in 1861. His shop developed into a large ship repairing works, and he became wealthy, being a large ship owner.

John Taylor Gause, president of the Harlan & Hollingsworth Company, Wilmington, Del., died in that city December 1, seventy-five years old. He began his career as an errand boy in the employ of the company in 1843; in 1858 he became an equal partner in the firm with Samuel Harlan; and in 1883, the firm having been for some years a corporation, he became its president.

Thomas Glover, of the firm of Glover Brothers, iron founders of Philadelphia, died in that city November 28, fifty-six years old. Mr. Glover was born in England and came to this country while still a boy. He learned the molder's trade and for several years was foreman of the foundry of the Morris & Tasker Company. The firm of Glover Brothers began business about thirteen years ago.

John Cotter, an engineer whose specialty was hydraulic machinery, died at Norwalk, Conn., November 28. Mr. Cotter was about fifty-eight years old. He had some engine room experience in the navy during the civil war, operated for years a shop in Norwalk, served several terms as boiler inspector of the Fourth (Connecticut) Congressional District, and was superintendent of the Norwalk water works for several years. He was also for a time connected with the Risdon turbine works, at Mount Holly, N. J.

Among the passengers lost on the steamer Portland, recently wrecked on Cape Cod, was our esteemed contributor, William L. Chase, of Worcester, Mass. He, with his twelve-year-old son, had visited the Mechanics' Fair, in Boston, and they had then taken the steamer to visit his parents in Portland, Me., with the result so widely and deeply deplored. Mr. Chase was a native of Orange, Mass., and was forty-three years old. He was interested in machinery as a boy, and his uncle being senior partner of the Chase Turbine Wheel Company, he served his time as a machinist in the works of that concern. Then he became a student at the Worcester Polytechnic Institute, graduating from that institution in 1877, and soon after he went into

the employ of the Crompton Loom Works, where for twelve years he was chief draftsman, and since the consolidation of the Crompton and the Knowles establishments he had looked after the combined work. Mr. Chase was a man of exceptional ability and activity. He was highly appreciated as a draftsman, designer and mechanic. He was an exceptionally expert photographer. He was a ready and powerful writer. He made himself a brilliant and enduring local reputation as an advocate of and an untiring worker for good roads, with the result of transforming the thoroughfares of Worcester and its vicinity. Although Mr. Chase had not been a voluminous contributor to our columns, his occasional letters were among our best.

Charles Hoefinghoff, president of the Hoefinghoff & Lane Foundry Company, Cincinnati, Ohio, died in that city November 20, sixty-five years old. Mr. Hoefinghoff was a native of Germany and learned the molders' trade in that country, coming to the United States in 1853. He reached Cincinnati the following year and at once began to earn good wages at his trade, soon engaging in the grocery business, in which he prospered so that he was able to start a foundry in 1864. The business was steadily prosperous and grew rapidly, securing large contracts for the Cincinnati and other waterworks, cable roads and similar enterprises. Mr. Hoefinghoff was also president of the Bickford Drill & Tool Company, of Cincinnati.

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Commercial Review.

NEW YORK, SATURDAY EVENING, December 3 1898.

MACHINISTS' AND MILL SUPPLIES.

The heavy snow storms which have visited this section have caused some retardation in the supply business. The big heaps of dirty snow, which stand in the streets, epitaphed by facetious busybodies as monuments erected to the memory of the late Colonel Waring, are stumbling blocks in the way of commercial dealings. Some few lines are benefited, it is true. One supply house, for instance, notes a heavy demand for rubber horseshoes, and another for shovels, though what is wanted of the latter, we cannot imagine, since in this city, at least, no use is made of them.

The season's trade will aggregate a flattering total, as compared with last year, and a triumphant entry of '99 is inevitable. "Bradstreet's" says to-day of general commercial conditions: "The business world enters on the closing month of the year with so many favorable and so few depressing features in sight as to leave little doubt that the year 1898, as a whole, must hereafter furnish a basis for estimate when comparisons of large business are to be made." But why should not 1899 or 1900 furnish a better basis?

Though the closing and opening of the year for the supply trade will find it in a strong position, the few weeks clustering around that event are always undemonstrative in character. Inventory and holiday time is even now so close at hand that its forecast shadow tends to obscure the brilliancy of trade reflected in the early November market. The stock-taking period is availed of by some manufacturers for a shut-down and repairs, and, as our Pittsburg correspondent wrote last week, the supply men in that section expect at such time to reap a harvest from the mills. In the class of business done by the supply houses in this section the orders due to holiday repairs do not compensate for the tendency of manufacturers to let stocks run as low as possible before taking inventory. An illustration of that disposition is found in the statement of an emery wheel and machine dealer, that while orders are as numerous as ever, cash sales from store being heavier than for many months, the latter part of November did not show as large a volume of trade as the earlier.

Machine tool builders are now buying supplies about as actively as any class of manufacturers. Typewriter companies have lately made heavy purchases. The small arms manufacturers are rushed with orders, and have been in the supply market. Bookbinders, engravers and electrotypers are very busy; the latter industries, it is said, more than for eight years past. Builders' hardware is not particularly active now. The war checked building operations for the season, but it is anticipated that they will revive next spring.

PRICE CHANGES.

November saw a material advance in the price of twist drills. It is claimed that manufacturers now charge 10 per cent. or over, more than formerly. The reason is a "combination" or "agreement" among makers. These gentlemen still keep up the form and semblance of secrecy, as to that matter, but it is a mere shadow. There is a rumor that one of the leading manufacturers is not heart and soul in harmony with the others, but since that particular company has been noted for the maintenance of good prices, its withdrawal of co-operation, if such were to take place, would not necessarily entail disaster upon the figures. The advance in quotations of twist drills has caused some dwindling in orders, consumers being inclined to buy only enough to meet immediate necessities. The Naval Bureau of Supplies and Accounts, November 29, opened bids for supplies for the New York Navy Yard. The bids on a lot of twist drills showed notable uniformity. Out of a dozen estimates the lowest was $2,405.87, and the others ranged from $2,506.17 to $2,708.38. Montgomery & Co., New York, made the lowest quotation. On hand taps the bids ranged from $446.58 to $587.16, and on pipe taps from $192.50 to $431.52. In these cases the Fairbanks Company was the lowest bidder.

Makers of the best brands of files in several representative instances are a little quiet. Prices of files, which in times past have been strong when those of drills were weak, are now easy, while drill quotations are strong. We do not know that any actual reductions to private customers have been made, at least by leading manufacturers, but some recent bidding on a contract for the Washington Navy Yard shows a tendency to sell cheap. The lowest bidder made a figure of $7,709 on the lot, whereas another who asked nearly $2,000 more had considered his estimate to be a trump card. We are not apprised, however, what kind of files the lowest bidder, if he is awarded the contract, will put in.

A considerable increase in the prices of wood screws was made in November. The adjustment tended to equalize the prices of the larger and smaller screws. Roughly, the larger ones went up 10 per cent., while the smaller ones, one-third to one-half.

There is a fugitive report that taps and dies are not unlikely to be advanced, as a result of agencies similar to those which manipulated twist drills. If true it is not generally known among the supply trade, for extensive inquiry failed to confirm it.

POWER TRANSMITTING MACHINERY.

Manufacturers and sellers continue busy, in some cases as much or more so than ever; in others, somewhat less than a month ago. Orders have been of moderate volume, individually. A large Philadelphia company with offices here is receiving an improved demand from Mexico and elsewhere in Spanish America for shafting outfits for electrical purposes.

The manager of a wood pulley house has just returned from a trip through the Southern Atlantic States, and pronounces business conditions in Virginia and North Carolina greatly improved since he was there a year ago. Many new textile mills are starting up. In Charlotte, N. C., at least four houses have been opened for the sale of textile machinery and supplies. He did not explore South Carolina, Georgia was not active, so far as he observed. Florida is not to be judged as a manufacturing State, but in Jacksonville business was booming. A dealer there in supplies of all sorts, from bricks to fine machinery, stated that he had as much business as he could attend to. The encampments of the army proved an important commercial stimulus to the South. They resulted in a large increase of travel, in the wake of which has followed business.

CUBAN TRADE.

The old times of fat Cuban markets have been trying hard to come back again in spite of Spanish occupation and tariff

control, and with the assumption by the United States Government of the administration of the island's affairs, will doubtless return with a rush. The new tariff schedule that has been drawn up is considerably lower than the old one in most of its specifications, and is expected to promote trade in machinery, locomotives and agricultural implements, as well as food and cotton goods, from the United States. Although the same duties will be enforced against us as against other countries, our manufacturers will have the advantage in freight rates and knowledge of the market. Although the bulk of merchandise already ordered has been held, waiting for the promulgation of the new tariff, the Cuban steamers have been so overcrowded that freight room is difficult to obtain, and it is predicted that soon more vessels will be necessary to handle the freight. It is thought that early next year the service between New York and Cuba of the Compañia Transatlantica Española will be resumed.

It is said that normally the active season of Cuban machinery trade begins in February or March, and closes by August. This is because of the sugar season. Grinders expect to have their mills ready for work by August 15.

Following are some examples of Cuban and other Spanish-American orders, which have come within our personal cognizance: A local emery wheel and machine dealer has had a call from Cuba for some apparatus for grinding tobacco knives. Its peculiarity was such that he did not have it on hand, and was forced to reply that the best he could do was to have it made. A twist drill and tool seller remarks that he has just sent two consignments of drills, taps, etc., to West Indian ports, one being a military contract for Santiago, and the other a private order from Puerto Rico, supposedly to replenish a dealer's stock.

A leading file handling firm tell us that they expect to send a man to Cuba after the first of the year.

J. F. Rogers & Co., New York, one of the largest ante-bellum Cuban exporting firms, are in that field once more, and already getting considerable business. Yesterday they shipped to Havana twelve cases of small machinery, supplies, hardware, etc., intended for repair purposes. Another Spanish-American order which they are now filling is a large slice of a contract for $40,000 worth of sugar machinery, destined for Costa Rica, which arrived through a local banking firm. Among the apparatus supplied will be dessicators, vacuum pans, centrifugal fans and wagons for transporting the sugar from one part of the mills to another.

A Havana correspondent of the "Evening Post," New York, writes thus in regard to the machinery opportunities offered by the island: "A cursory reference to the unused opportunities for doing business in Cuba could not omit mention of the chance which machinery makers have here immediately before them. An American machinist, who had been long in the land before the last insurrection, says that everywhere, on every plantation, the machinery is wrecked or much out of repair. One Philadelphia firm has done most of the machinery business of the island, supplying everything, from locomotives to monkey wrenches. It is now waiting for the new tariff to go into operation before bringing down immense quantities of tools, hardware, and machinery already ordered. There are only two good machine shops on the island, and these are expecting to have fortunes thrust upon them by planters eager to resume the cultivation of their lands, for my informant asserts, 'There is big money in repairs.' Were that generally true, there ought to be 'big money' in Cuba. She needs repairs everywhere."

HINTS ON EXPORTS.

Three weeks ago, upon private information, we predicted that the municipal council of Shanghai, China, would advertise for bids for concessions to install telephone and electric railway systems in that city. Such announcement has appeared in the daily papers this week. The telephone concession will run for thirty years, and that for the 23 miles of tramway will, it is believed, last for the same time. Blackall & Baldwin, 39 Cortlandt street, New York, represent the Shanghai municipal council and all proposals are to be sent to them.

Consul Jackson writes to the State Department from La Rochelle, November 9, 1898: "There is an opening in this consular district for several steam engines and boilers of American make. The engines must be 35 horse-power, and the boilers must be capable of supplying these engines. The prices, including cost of transportation, etc., to this district, or Tonnay-Charente, should not exceed those asked here (about $2,000). Correspondence, with specifications and

(*Continued on page 38.*)

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Business Specials.

Gear wheels, gear cutting, Grant; see page 18.

Forming Lathes, Mer. Mach. Tool Co Meriden, Conn.

Selden Packing for stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., N Y.

For rent, with power, whole or part manufacturing building, four floors, 110 x 35. P. O. Box 886, New Haven, Conn.

A manufacturing concern having large shops with modern tools, foundry, pattern shop, etc., is desirous of adding to its present line, and wishes to negotiate with parties wanting mach'y built. Box 36 Am. Ma.

For Sale or Rent—Foundry and machine shop with additional land, in good condition and well equipped for medium heavy work; capacity of foundry 7 tons per day; located on railroad within eight miles of New York; terms easy. Call or address J. F. Sweasy, 26 Nassau street, New York

Complete set American Machinists, 1877 to 1898, for sale; first 18 vols. bound in morocco, uniform in style (binding alone cost $4.75 per vol.); 1897 vol. 19 in cloth; 1897 vol 20 (includes advertising, and is in leather; 19 volumes have name of private individual on side; will sell the twenty volumes complete for $100. Address Volumes, care American Machinist.

Wants.

Situations and Help Advertisements only inserted under this head. Rate 30 cents a line for each insertion. About seven words make a line. The cash and copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded. Applicants may specify names to which their replies are not to be forwarded; but replies will not be returned. If not forwarded they will be destroyed without notice. Original letters of recommendation or other papers of value should not be inclosed to unknown correspondents.

Situations Wanted.

Position by draftsman, seven years' experience, tech. education. Box 145, Am. Mach.

Salesman at liberty would manage N. Y. office; salary or commission. Box 152, Am. Machinist.

Mechanical draftsman shop and drawing room experience, desires to change. Box 148, Am. Machinist.

Draftsman, stat. and marine engine, pumps, general machine, for New York or Brooklyn. Box 144, Am. Ma.

Mechanical draftsman with technical and drawing room training, would like change. Box 142, Am. Mach.

Situation wanted by tool, die and model maker on small work. Tool job or charge of shop on light work. References. Box 150, Am. Mach.

Wanted—A position as foreman patternmaker, by man of 40 years; a hustler, with best references. 58 Talcott avenue, Springfield, Mass.

Young man exp. mach; technical training; 18 mo. experience in drawing room, wishes position with steam eng. or refrigerator co. Box 151, Am. Mach.

Draftsman and mechanical engineer, 20 years' varied experience; practical designer of high grade engines, tools, etc., desires situation. Box 23, Am. Machinist.

Desire change; experienced tool and die maker; general all round mechanic; capable of designing and taking charge of shop. Box 140, Am Machinist.

Grad. Tech School; seven years' exp. in fdy. and mach. business, at present supt. of large steam heating works, would like to make a change January 1st. Address, Box 149, Am. Machinist.

Situation wanted by experienced superintendent of a factory; handled 300 men for 8 years; have a first-class high speed engine, would like to put on the market; regulation 1 1-2 per cent. Box 143, Am. Mach.

Wanted—Position as foreman toolmaker; 6 years' experience on Hartford automatic screw machines; designer and draftsman; exceptionally good ref; married; temperate; aged 42. Hartford, care of Am. Mach.

Help Wanted.

Wanted—Ten first-class machinists for night turn. Apply by letter to Bucyrus Co., So. Milwaukee, Wis.

Wanted—An experienced draftsman. State experience, age and satisfactory salary. Box 146, Am. Mach.

Wanted—Foreman for machine shop working about 75 men. State experience, references and wages desired. Address, Box 147, Am. Mach.

Wanted—First-class machinist familiar with pump work, to take charge of small pump shop as a working foreman. Box 114, American Machinist.

Wanted—Draftsman who has had exp. in designing presses, drop hammers and spec. mach., and who can take charge as supt. Box 128, American Machinist.

Wanted—A1 Draftsman with experience on printing presses. Address W. H. Golding, 183 High St., Boston, Mass., stating age, exper. and pay required.

Wanted—Salesman to travel; one understanding presses and capable of estimating on dies and special machinery preferred. Box 127, American Machinist.

Wanted—A first-class draftsman, one familiar with rolling mills, hydraulic and general transmission machinery; state age, salary required and experience. Address X Pennsylvania, care of Am. Machinist.

Wanted—A thoroughly experienced designer and draftsman who has had extensive practice on large Corliss engines and marine engines. Address, with references and full particulars, box 452, Pittsburg Pa.

Wanted—Good business man to take charge of branch office, New York city; knowledge of mechanics and willing to invest $5,000; business established and increasing; sales this year $40,000. Box 138, Am. Mach.

A concern building a complete line of punch presses of the highest class desires a foreman; applicant must be a thorough and practical mechanic, capable of obtaining the best results from the men in his charge. Address Box 136, American Machinist.

Wanted—Boiler shop manager and supt.; one who is thoroughly competent to take charge of a shop employing from 30 to 60 men; is expected to handle sales, estimates, etc; in applying state exp., refs and salary expected, also how soon could begin work if engaged. Address Box 125, American Machinist.

Wanted—A large manufacturing plant in the iron line (working about 500 men), about to locate in Chicago, wishes to engage a supt. and foreman for each d'p't'm't, viz., forge shop, mach. shop, wood-shop, paint shop and eng'ring d'p't'm't; replies cannot be too specific in all points. Ad. Lock Box 1194, Chicago, Ill.

Wanted—A first-class superintendent for a machine tool works; one who is entirely familiar with the business, from the drawings to the finished machine. Must be a hustler, and come well recommended. State age and where last employed. One familiar with the building of planers preferred. A good position for a first-class man. Address, Box 148, Am. Mach.

(*Continued from page 37.*)

prices, should be addressed to Mr. Grenfel Stewart, 13 Rue du Palais, La Rochelle, France."

MISCELLANEOUS.

Bids were opened November 26 at the Bureau of Yards and Docks, Navy Department, for a 40-ton jib crane for the Port Royal Navy Yard, as follows: E. M. Bailey Company, Charleston, S. C., $12,500; no check; William Sellers & Co., Inc., Philadelphia, $42,368; Morgan Engineering Company, Alliance, Ohio, f. o. b. Alliance, $49,687; delivered at Port Royal, $4,500 additional; American Hoist and Derrick Company, St. Paul, $39,950; Brown Hoisting and Conveying Machine Company, Cleveland, Ohio, $44,500.

AN ELEVATOR CONSOLIDATION.

In Trenton, N. J., have been filed articles incorporating the Otis Elevator Company; object, to manufacture elevators, hoisting apparatus, engines, dynamos, pumps and machinery. This new company includes the former Otis and other elevator interests, comprising, it is said, a large proportion of the elevator manufacturing property of the country. The capital stock is $11,000,000; $4,500,000 being preferred and $6,500,000 common. The stockholders are to have more control than in most combinations.

CHICAGO MACHINERY MARKET.

The calendar year is so near its point of final extinguishment that all machinery supply men know with close exactitude just what it has had for them by way of business. Those who have large stocks are already buried in the annual task of inventory, and with few exceptions they can give percentages of increase for the year over its predecessor. Without exception the comparison is favorable, and with very few variations extremely so. Percentages of increase usually range from 25 to 75 per cent. The year is ending with the margin between this and last year as wide as it had been in previous months, although last year business with some houses signaled a decided improvement in November and December. Their margin of increase is narrower than that of others, but the average improvement is notable. One large seller says that in July this year he had caught up with the trade of the whole of 1897, and orders have since been satisfactory to him.

Specialization of the expanded trade is impossible. It has reached out and taken everything in sight, and all kinds of supplies have shared in the benefits. In Chicago there is scarcely an industry in the iron working line that has not been building additions to plants this year. Perhaps by 50 per cent. more industrial wheels are now turning than at this time last year. It is a common practice for plants to run two forces of men—a day force and a night force. It

(*Continued on page 39.*)

Miscellaneous Wants.

Caliper catalog free. E. G. Smith, Columbia, Pa.

Book, Dies & Die Making, $1. J. L. Lucas, Prov., R. I.

The Dutton Wet Twist Drill-Grinder is sold by the Garvin Machine Co., New York City.

Light and fine mach'y to order; models and electrical work specialty. E. O. Chase, Newark, N. J.

Lt and h'vy mchy., exp'l and sp'ly b'l't. mdrn. appl. and tls.; prices reas'ble. Wm H. Baker, Trenton, N. J.

Engineers and firemen, send 10 cents for a 24-page pamphlet containing a list of questions asked by an examining board of engineers. George A. Zeller, bookseller, 18 S. Fourth Street, St Louis, Mo.

Wanted—Lathe 30 in swing to take 9 feet between centers. Must be A1 modern mach. Lodge & Shipley preferred. State lowest cash price on board the cars at Chicago. Must be cheap. James Rowe, 76 Jackson Boulevard, Chicago.

Wanted—Machine tool man with from $10,000 to $20,000 to take contract to build twenty-four well-known lathes per month for five years; drawings, patterns, gigs, templates and special tools are furnished; straight selling. Address Box 141, AMER. MACHINIST.

Wanted—Copies of November 10, 1898, issue. We will extend any subscription in the United States 1 month for a copy in good condition. Send paper with name and address to subscription Department of AM. MACH.

Institutions retiring from business having machine tools, brass or wood working machinery, will find it to their interest to correspond with us. We purchase complete plants or handle them on com. C. C. Wormer Mach Co., 55-59 Woodbridge st., W., Detroit, Mich.

A Belgian eng who had the management of large establishments and possesses influential connections wishes to represent in Europe mfg works producing cast iron, steel in blooms, in profile, cons't companies, &c. Address Mr. Lejeune, engineer, Charlerol, Belgium.

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1—27 in. x 27 ft., L. & D. "Standard" Engine Lathe, taper attachment.

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Comb, twist drill thread pitch, centre and top drill gauge.

Price, $1.50 each.

Gauge and 510 page catalog sent postpaid for $1.60 or catalog alone for 25c.

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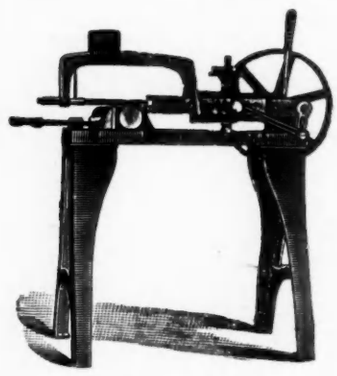

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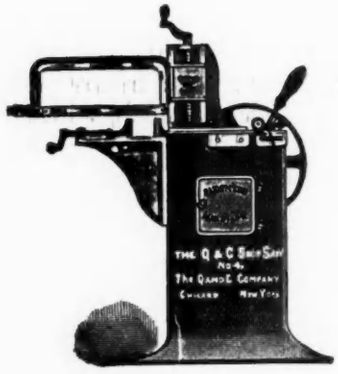

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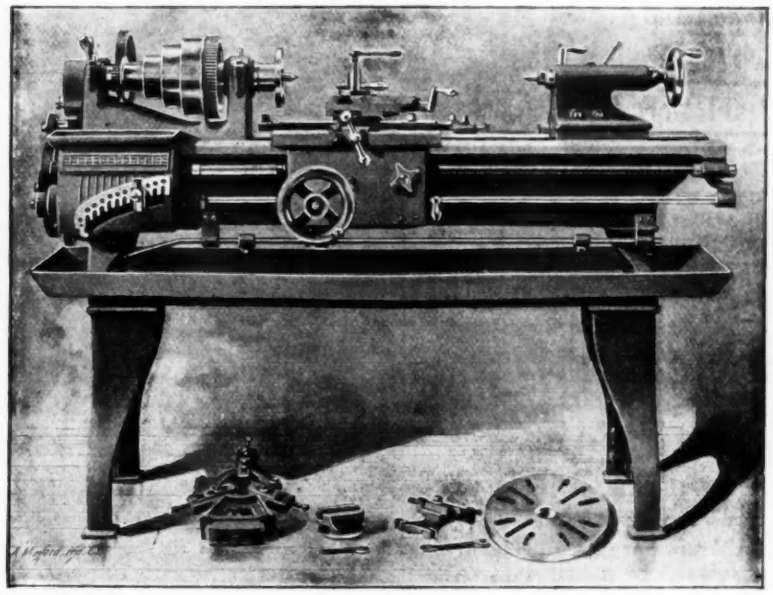

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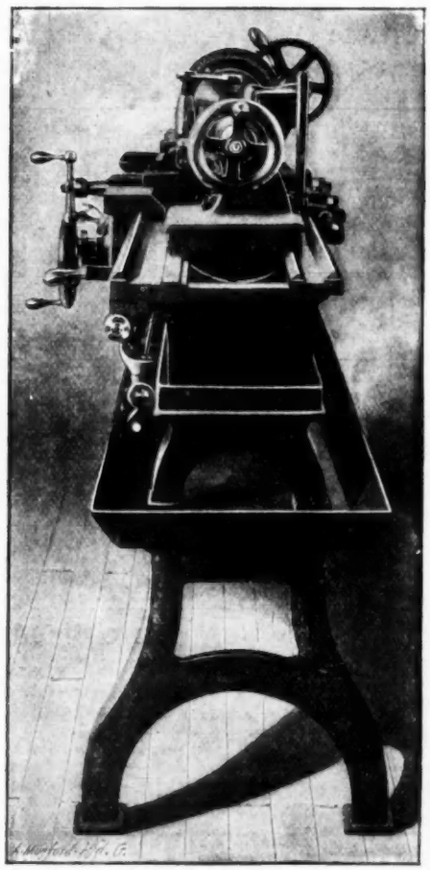
Especially designed for work in tool-rooms, experimental stations, and fine machine and repair shops. Fitted with either raise and fall or plain carriage. With or without improved taper attachment in connection with plain carriage.

This Lathe can be fitted with wire chucks in any decimal under half inch, which are invaluable for finishing small taps, reamers, special screws and studs, and other work right from the rod—no cutting off and centering of work required.

Cross-feed screw graduated to thousandths of an inch.

Beds made in 4 ft., 5 ft., and 6 ft. lengths.



END VIEW OF THE HENDEY-NORTON ENGINE LATHE.

The

Hendey Machine Co.,

TORRINGTON, CONN.

Agents for the Pacific Coast: Pacific Tool & Supply Co., San Francisco, Cal.
J. W. Cregar, Philadelphia Bourse Exhibition.

European Agents: Schuchardt & Schutte, Berlin, Vienna, Brussels; Chas. Churchill & Co., Ltd., London and Birmingham, England. Adolphe Janssens, Paris, France.

(*Continued from page 38.*)

is the daily experience for superintendents to be visited by machinists asking for work. They say they are working at night at somebody's shop and want a day job. The supply of machinists is ample, but there is dearth of the best class of men, who have thoroughly learned their trade.

Last week the Chicago Portland Cement Company closed a contract with the Hill Clutch Company, of Cleveland, Ohio, for the transmission of power outfit for their new plant at Morris, Ill., to succeed the plant that was burned some time ago. The work amounts to about $5,000. There have been recently quite a number of orders for shafting, belting, etc., running from $1,000 upward. Belting people report general activity in iron-working shops, with an awakening of activity in the lumber regions. One branch of the bicycle business that is now picking up notably is the jobbing trade. The explanation of manufacturers is that the small bicycle shops throughout the country, that make a few wheels to order and do a repair business, will be busy.

In the primary steel markets last week the feature was the sale of almost 250,000 tons of steel rails here, and a similar amount in the East for next year's delivery. This is the output of about four months' production. The promise is that the railways will be a large factor in the iron markets of 1899.

The Armstrong Brothers Tool Company had the best month's trade in November in their history. The Compress Wheel Company make a like report.

The Pearson Machine Company have just sold four cartridge loading machines and have made their initial sale of drills in Sweden.

▲ ▲ ▲

Quotations.

NEW YORK, Monday, Dec. 5.

Iron—American pig, tidewater delivery:

No. 1 foundry, Northern	$11 25 @ 11 50
No. 2 foundry, Northern	10 75 @ 11 00
No. 2 plain, Northern	10 50 @ 10 75
Gray forge, Northern	10 00 @ 10 25
No. 1 foundry, Southern	11 25 @ 11 50
No. 2 foundry, Southern	11 00 @ 11 25
No. 3 foundry, Southern	10 50 @ 10 75
No. 1 soft, Southern	11 50 @ 11 75
No. 2 soft, Southern	11 00 @ 11 25
Foundry forge, Southern	10 00 @ 10 25

Bar Iron—Base—Mill price, in carloads, on dock: Common, 1.05 @ 1.10c.; refined, 1.15 @ 1.20c. Store prices: Common, 1.30 @ 1.35c.; refined, 1.35 @ 1.50c.

Tool Steel—Base Sizes—Standard quality, 6 @ 7c., with lower prices on some brands; extra grades, 11 @ 12c.; special grades, 16c. and upward.

Machinery Steel—Ordinary brands, from store, in small lots, 1.45 @ 1.55c.

Cold Rolled Steel Shafting—Base sizes, from store, 2.25c. and upward, according to brand and quantity. **A ruling figure for moderate amounts is 2.31c.**

Copper—Carload lots, Lake Superior ingot, 12⅞c.; electrolytic, 12⅝ @ 12¾c.; casting copper, 12⅛ @ 12⅝c.

Pig Lead—Carload lots, 3.60 @ 3.62½c., f. o. b. New York.

Pig Tin—For 5 and 10 ton lots, 18⅛ @ 18¼c., f. o. b.

Spelter—In carload lots, 5.30c., New York delivery.

Antimony—In cask lots, 8.70 @ 9.50c., according to brand.

Lard Oil—**Prime city, present make, 44 @ 46c.** in wholesale lots.

Manufacturers.

The Pennsylvania Car Wheel Company, of Allegheny, Pa., is to erect a new boiler house to cost $6,000.

The Scriber & Conchar Company, Dubuque, Ia., will erect and operate a foundry, employing forty men.

The Port Huron, Mich., Steam & Thresher Works are erecting two large brick buildings in addition to their plant.

The National Starch Works Company has commenced work on a fourth story to its starch mill in Chesterfield, Ia.

The Jenkins-Bogart Company is enlarging its mill in Weld, Me., by an addition of 20 feet. This makes the main building 105 feet long.

R. K. Odell, of Waterloo, Ia., will open up a machine shop about January 1. The intention is to do repair work and light manufacturing.

The American Steel Barge Company, West Superior, Wis., will construct a new carpenter shop and mold loft in the yards there. The building is to be 360 feet long by 60 feet wide.

The Eaton Rapids (Mich.) Rolling Mill will build a brick addition to its works, 70x107 feet in size and two stories high, to cost $9,000, from plans by Architect Wm. Chapel, of Grand Rapids.

Preparations are being made at the river works of the Lobdell Car Wheel Company, Wilmington, Del., for an addition to the machine department, which will add to the facilities. New machinery will be installed.

O'Keefe & Orbison, Appleton, Wis., have a contract for the erection of a big paper mill at Ashland, which is to have two machines devoted to the manufacture of manila paper chiefly. The mill will cost in the neighborhood of $60,000.

Plans have been submitted for a soap works for the Fels Company, at Seventy-third street and Woodland avenue, south of Island road, Philadelphia, Pa. The structure will be of stone, concrete and frame, covered with galvanized iron, and measure 30x40 feet.

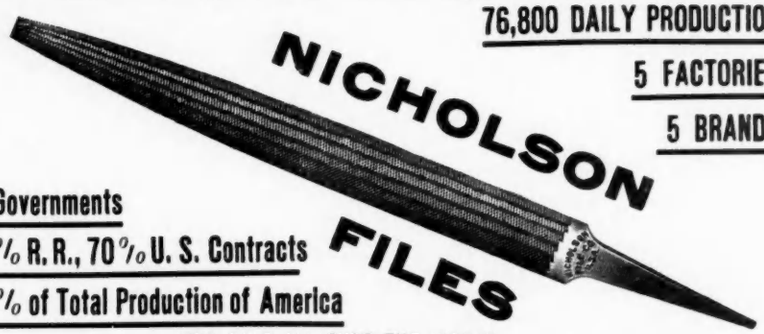
The Deering Harvesting Machine Company, Chicago, Ill., has taken out a permit for the construction of another building to be added to its plant. It will be known as the drop forge building, two stories high, and will cover an area of 206x289 feet. The cost is placed at $75,000, and construction is already under way.

Steul & Thuman, wood mantel manufacturers, are to have a new factory in place of their present one at No. 278 Johnson street, Buffalo, N. Y. Plans are ready for a four story brick building to cost $20,000. Architect Fred Mohr made the plans. The factory is expected to be ready for use by March 1.

The plant of the American Stove Board Company, of which J. McGregor Adams, president of the Adams & Westlake Company, is the president, wil be established at Chicago Heights, being removed from the present location at 500 to 506 Clybourn avenue, Chicago. The work of construction on the new factory buildings has begun.

The Fred W. Wolf Company, of Chicago, has on hand work for a number of industrial plants for outside cities. For Odessa, Mich., they have planned a four story cold storage building, 36x60 feet, and a one story machine and boiler house, 36x44 feet, for A. C. Hager. Both buildings will be of brick and stone, and will cost about $15,000.

The Thomas Furnace Company, of Niles, Ohio, has been incorporated with a capital of $100,000 they expect to build a factory and will build all kinds of furnaces. A reliable report says they will have a foundry department in connection with their plant in a short time. The incorporators are John M. Thomas, W. Aubrey Thomas, Patrick Sheehan and Wm. H. Otterman.



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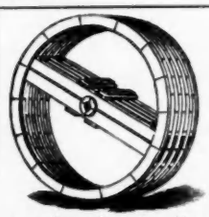

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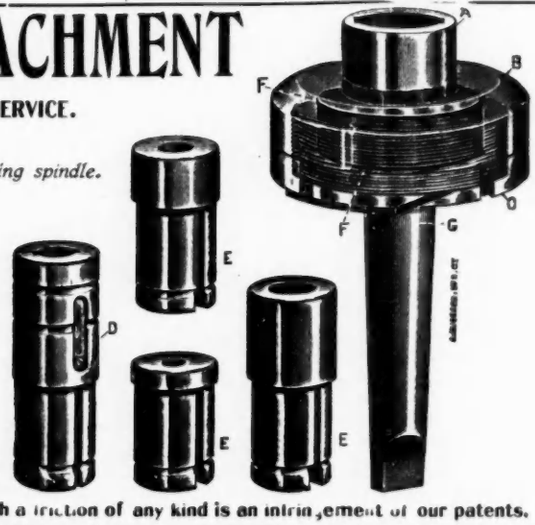

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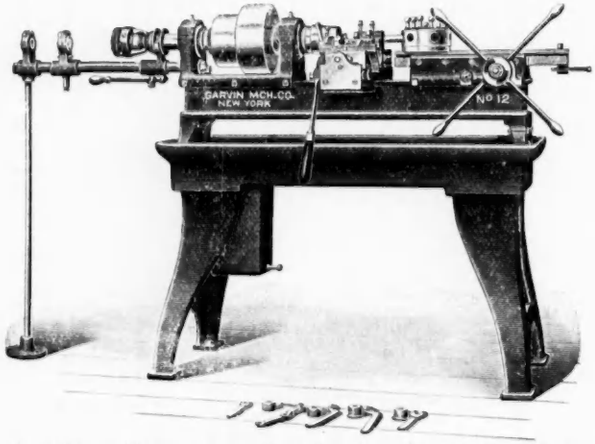

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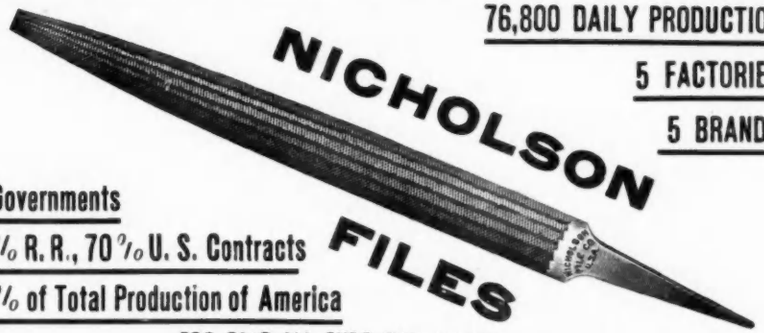

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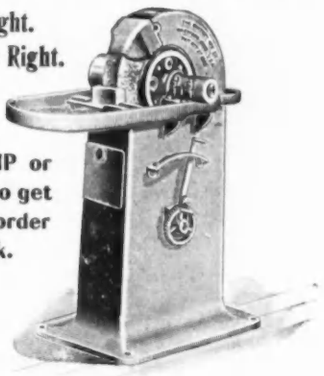

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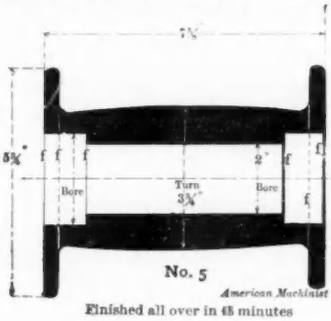

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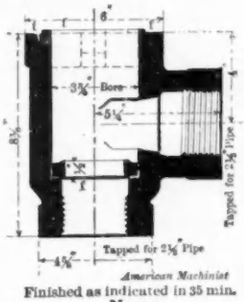

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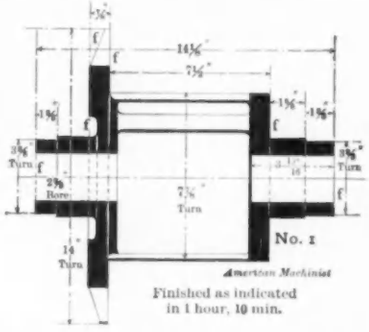

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Schuchardt & Schütte, Spandauer-strasse 59-61, Berlin, C., Germany.
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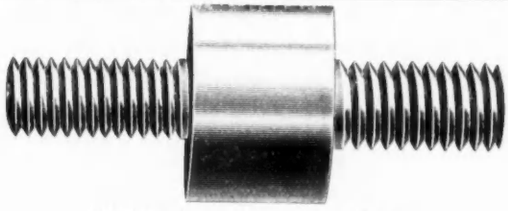
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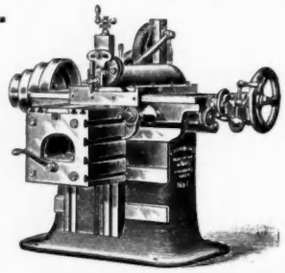

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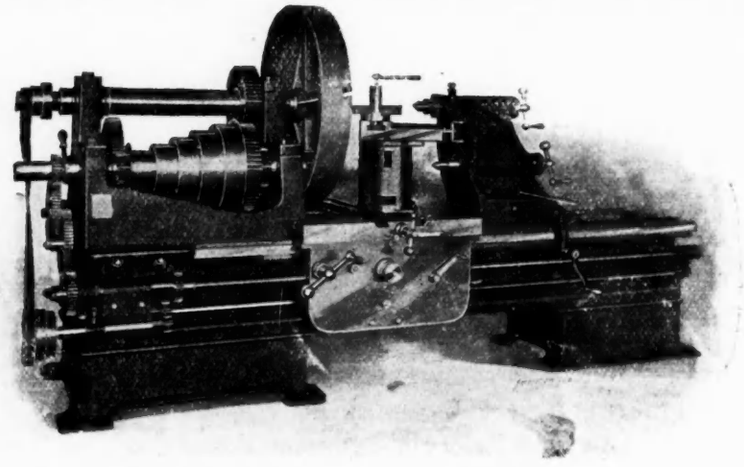

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Being two lathes standing in the same place on the floor, one a 26-inch swing lathe for light work, the other a 44-inch swing for heavier work. Has a wide range of speeds and feeds. Hollow spindle with 2⅛ in. hole. Just exactly the right kind of a lathe to have in a shop. Fuller particulars for the asking.

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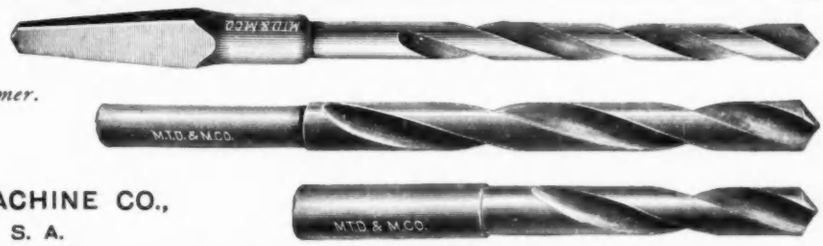

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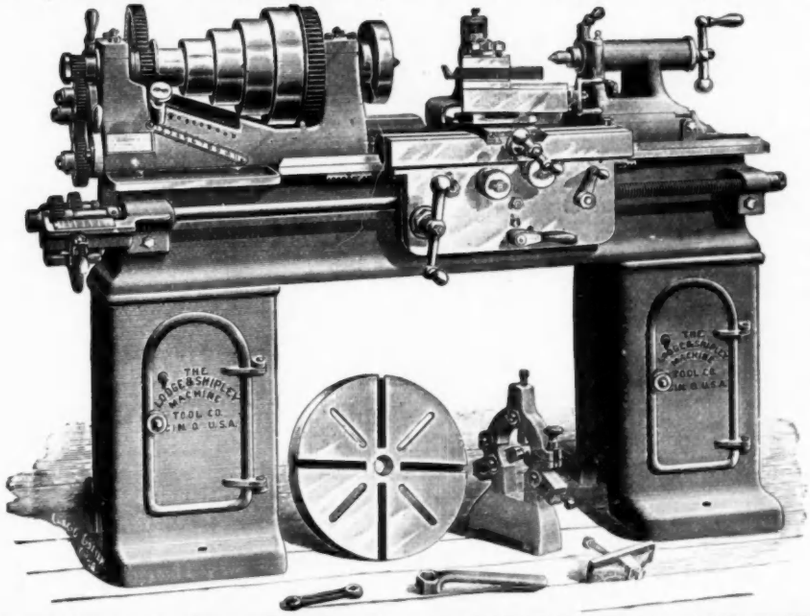

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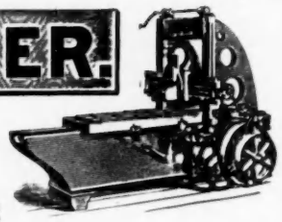

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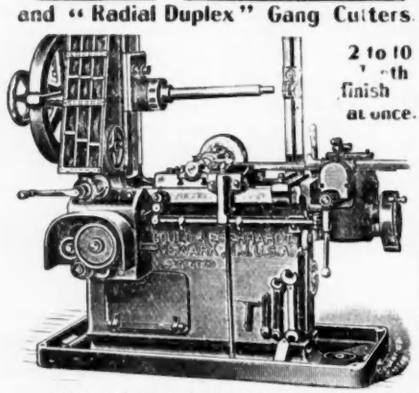

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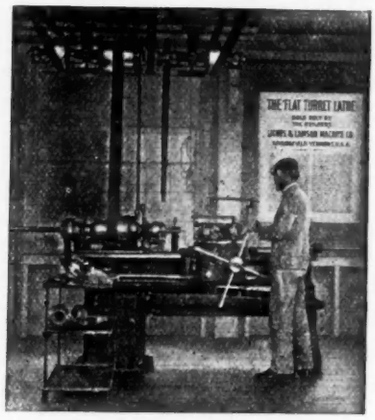

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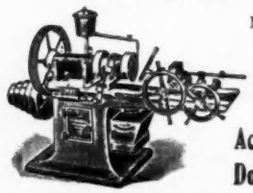

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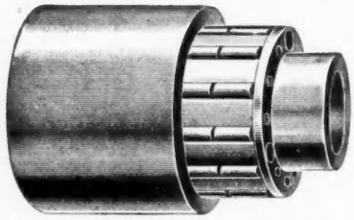

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